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OF

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INDEX.

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INDEX.

A.

Page

Abortion in Mares 558
Agricultural Gossip 173
,, Lectures 4, 92, 284, 439
,, Shows 451
Ammonia from the Air 203
Angora Goat Breeding 256
,, Experience with 562
Annual Reports 381
,, Shows 311
Answers to Correspondents 494
Apples, Export of 2
Atmosphere, A Fertiliser from the 322

B.

Bacteria Lamp, A 2
,, Lectures on 299, 363, 525
Bedding for Pigs 506
Bee-hive, Opening the 324
Bee Inspector's Report 241
Bee-keeper's Conference 168
Bee-Moth, The 334
Bee Notes 131, 242, 323, 433, 475
Bees and Honey 74
Berkshire Pig, The 204
Black Scale 90
Bulls, Stud 561
Butter v. Oleomargerine 185
Butter, Keeping Quality of 506
Breeder's Table 543

C.

Page

Calves, Scour in ... 505
Capped Hock ... 1
Chapman Experimental Farm ... 145
Charcoal for Fowls ... 327
Climate of W.A. ... 80, 195, 274, 239, 498, 582
Codlin Moth, Spray for... 281
Comb, Capped and Uncapped, Honey from ... 477
Conference, Bee-keepers' ... 168
,, Producers' ... 36
Co-operation in the Purchase and Testing of Manures and Feeding Stuffs ... 176
Correspondents, Answers to ... 494
Crop Outlook, The ... 253

D.

Dairy Herd, Formation and Management ... 486
Diseases, Plant ... 39
Dubbing Fowls ... 203

E.

Experimental Farm, Chapman... 145
,, ,, Students for ... 176
,, Notes ... 291
Export of Apples ... 2
Ewes and Lambs, Mortality in ... 2
Ewes, Period of Gestation in ... 326

F.

Farm, Chapman Experimental... 145
,, Narrogin Experimental, Report on ... 242
Farmers, Sparrows for ... 282
Farms, Experimental, Students for ... 176
Feeding Stuffs and Manures, Co-operation in Purchase and Testing of ... 176
Fertiliser from the Atmosphere ... 322
Fertilisers for Oranges ... 335
Fig, Smyrna ... 2
Flax-growing in Victoria ... 49

	Page
Food, Preservatives in	329
Fowls, Charcoal for	327
,, Dubbing	203
Frog, Horse's, "Thrush" in	90
Fruit from Bridgetown	91
,, Fly Parasite	1
,, Importation	87
,, Tree and Plant Importation	88
Fumigation, Spraying and	224
Fungoid and Insect Pests	20, 105

G.

Gapes, Cause and Cure of	484
Garden and Orchard Crops—Pests and Remedies	25
,, Notes	77, 191, 271, 336, 496, 580
Gestation in Ewes, Period of	326
Goats, Angora, Breeding	256
Green Crop Manuring	47

H.

Hamel, Maize and Potatoes Grown at	152
Harvest Notes in France and Algeria	347
Hen, A Freak, averages two eggs a day	185
Herd, Building up the	331
,, Dairy—Formation and Management of	486
Honey, Bees and	74
,, from Capped and Uncapped Comb	477
Horses Frog, "Thrush" in	90
Horses, Young, Worms in	90

I.

Inoculation of Soils for Lucerne	205
Insect and Fungoid Pests	20, 105
,, A Nut-Grass Destroying	254
,, Pests	201
,, Pests in California	564
Importation of Fruit	87
,, of Fruit Trees and Plants	88

J.

	Page
Judging Live Stock by Points	207

L.

Ladybird, Good Work of the	296
Lambs and Ewes, Mortality in	2
Lamp, A Bacteria	2
Laying Record	282
Lectures on Bacteria	299, 363, 525
Lucerne, Inoculation of Soils for	205

M.

Maize and Potatoes grown at Hamel	152
Maize-growing	201
Manures and Feeding Stuffs, Co-operation in purchase and testing of	176
Manures and how to mix them	559
„ Management of	297
Manuring	260
„ Green Crop	47
„ Orchard	201
Mares, Abortion in	558
Market Reports	75, 187, 262, 494, 577
Mites, A remedy for dreaded	333

N.

Narrogin Experimental Farm, Report on	242
Nest, The Trap	328
Notes	1, 89, 201, 281, 345, 505
Nut-Grass Destroying Insect, A	254

O.

Oleomargerine v. Butter	185
Oranges, Fertilisers for...	335
Orchard and Garden Crops—Pests and Remedies	25
„ Manuring	201

P.

Page

Parasite, Fruit Fly ... 1

Parasites, In search of ... 132, 518

Pests of Orchard and Garden Crops, and their Remedies ... 25

Pig, The ... 245

,, The Berkshire ... 204

Pigs, Bedding for ... 506

Plant and Fruit Importation ... 88

,, Diseases ... 39

Potato Culture ... 54

,, Diseases, Prevention of ... 258

Potatoes and Maize Grown at Hamel... 152

,, in Germany ... 202

Poultry Farm, A Great... 181

,, House, Whitewash the ... 493

,, Notes ... 33, 99, 249, 319, 435, 540

Preservatives in Food ... 329

Producers' Conference ... 36

Pruning of Tomato ... 3

R.

Rabbit Pest in N.S.W.... 555

Rainfall of W.A. ... 83, 197, 277, 341, 501, 585

Ramie Fibre ... 42

Records, Keeping the ... 283

Report, Bee Inspector's ... 241

Report on Narrogin Experimental Farm ... 242

Reports, Annual ... 381

S.

Scour in Calves ... 505

Separators, Prizes for ... 281

Shows, Agricultural ... 451

,, Annual ... 311

Silage, Uncut ... 325

Smyrna Fig ... 2

Soils, Inoculation of, for Lucerne ... 205

Page
Sparrows for Farmers 282
Spray for Codlin Moth... 281
Spraying and Fumigation 224
Statistical 103
Stock, Live, Judging by Points 207
Students for Experimental Farms 176
Swine Fever 418

T.

"Thrush" in Horses' Frog 90
Ticks, New Cure for 282
Tomato Pruning 3
Tomatoes, effect of thinning 507
Tomatoes, Late 89
Trap Nest, The 328

V.

Vineyards, Amongst the French 508

W.

W.A. Producers' Co-operative Union 293
Wheat Crop, Indian 202
Whitewash the Poultry House 493
Worms in Young Horses 90

Z.

Zamia Plant 162

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JOURNAL

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OF

WESTERN AUSTRALIA.

Vol. VIII. JULY, 1903. Part I.

NOTES.

Fruit Fly Parasite.—It has been decided by the Hon. the Minister for Lands to send Mr. Compere, the Entomologist of the Department of Agriculture, to India and the Malay Archipelago to find and secure, if possible, the parasite to the Fruit Fly.

The Handbook on Horticulture and Viticulture.—We are now able to announce that the last of the matter for this book is now in the printers' hands, and will be ready shortly. The price has been fixed—paper covers, one shilling; stiff boards, two shillings and sixpence.

Agricultural Lectures.—During the absence of Mr. Despeissis, who is on a visit to Europe, Mr. P. G. Wicken will continue the course of lectures at the Training College, Claremont. Mr. Wicken will deal chiefly with stock, the different breeds, dairy work, and diseases of stock generally.

Capped Hock.—To cure capped hock in horses, first reduce the inflammation by lead lotion, then cover the swelling with a thick layer of pipeclay, leaving it on for as long a time as possible. This in drying forms a firm cake, which makes equable pressure on the swelling, and promotes its absorption.

RESIGNATION.—We regret to have to chronicle the resignation of Mr. Berthoud, who has for some time past had charge of the Experimental Farm at Hamel. Mr. Berthoud, who has been very successful in the work of hybridizing wheat, has accepted an appointment under the Transvaal Government. The good wishes of all his fellow officers go with him.

EXPORT OF APPLES.—Apples, says a Liverpool correspondent, are in most active demand, and American and Canadian are now doing well. A large direct arrival of Tasmanian recently went off very readily, mostly at 8s. to 11s. per box. Apples from Victoria, Australia, are just now considered the best fruit of the kind on the London market, some of the dessert varieties being pronounced very fine. Tasmanians are not considered so good.

SMYRNA FIG.—The Hon. the Minister for Lands has approved of the importation of a number of the true Smyrna fig trees, together with the Wild Capri fig tree. So soon as the latter are properly established, arrangements will be made to introduce colonies of the Fig Wasps, as this State is in every way suitable to the growth of the fig. The introduction of this, the true fly of commerce, will open up a new, and what must eventually prove, a most extensive and profitable industry.

A BACTERIA LAMP.—A Reuter telegram from Vienna, dated 15th March, says:—"Professor Hans Molisch, of Prague, has reported to the Vienna Academy of Sciences the discovery of a lamp lighted by means of bacteria, which, he claims, will give a powerful light and be free from danger, thus being valuable for work in mines and powder magazines. The lamp consists of a glass jar, in which a lining of saltpetre and gelatine inoculated with bacteria is placed. Two days after inoculation the jar becomes illuminated with a wonderful bluish-green light, caused by the innumerable bacteria, which have developed in the time. The light will burn brilliantly from two to three weeks, afterwards diminishing in brightness. It renders faces recognisable at a distance of two yards, and large type is easily legible by it. Professor Molisch asserts that the lamp yields a cold light which is entirely safe."—*The Times.*

MORTALITY IN EWES AND LAMBS.—The circumstances connected with the loss of ewes and lambs, says the *Live Stock Journal,* are such as we find prevailing to a greater or less extent each year. I do not think we are wrong in attributing this to the ewes being fed too much on roots during the later stages of pregnancy, often to the exclusion, or nearly so, of dry food. This causes the death of the lambs before birth, and from the decomposed state in which they are frequently born, the womb of the ewe becomes affected, and death of both ewe and lamb is a common occurrence. The lambs whose joints are stiff are the victims of rheumatic arthritis caused by lying on damp ground in cold weather. Those which have their eyes affected are also suffering from climatic influences, but in their case it is the cold east wind which is doing the mischief. It is necessary to attend to the diet of the ewes before and after lambing, and, when inclement weather prevails, to afford shelter and dry situations as much as possible to the lambs.

Tomato Pruning.—Many people believe it to be an established fact that cutting back or pruning tomato plants will ripen the fruit earlier and produce a larger crop, some even claiming that this practice will increase the crop nearly half; but the result of a careful investigation and experiments with this system of culture by the Tennessee Experiment Station would seem to show that trimming or pruning tomato plants is not only useless, but an absolute detriment to the grower. They say in regard to it: "The object of pruning was to check the growth of leading shoots, thus inducing new branches to be thrown out near the roots, making the plants low, stocky, and bushy. We commenced the operation soon after the plants had become established in the field, and repeated at intervals of three weeks, until half the crop had matured. About two inches of the tips were removed at each pruning. When the plants came into bearing they were round and well formed, and we naturally expected a decided increase in the yield, but such was not the case. Trimming decreased the yield on every plant, and nothing was gained in earliness." Yet, on the other hand, the experience of the editor of this publication is exactly the reverse, and he would much like to hear from growers on the subject. Mr. Despeissis, in referring to the pruning of the tomato, says:—"If large-sized, early tomatoes are required, the plants should either be forced and planted out early, or sown towards the end of August, and protected from frost by means of a light mulching. One stalk only is allowed to grow, and lateral leaf shoots pinched off, the terminal shoot alone being allowed to remain. The fruit bearing laterals are left on the plant, and will soon set to fruit. The plant is trained either along short stakes or along a trellis, made of wire stretched between two short posts stuck at each end of the rows. This will keep the plants off the ground and make the operations of spraying and picking easier. The tomato rot is not so severe on staked vines as on plants crawling over the damp ground, whilst by training the plants it is easier to get at the cut worms and the green caterpillars with arsenical baits and sprays. After a while a few leaf laterals are allowed to grow, if it is feared that the crop might be injured by sun-burn. Large-sized and early tomatoes will thus be obtained. For home use the tomato plant is seldom pruned. It bears enormously, but the fruit is smaller and somewhat later in ripening."

AGRICULTURAL LECTURES.

TWENTY-SIXTH LECTURE—(*continued*).

ROOT CROPS.

Irrespective of their botanical characters, farmers have broadly classified their crops into grain crops, fodder crops, root crops, etc. To some of these we will devote a few moments.

All root crops are not roots. The potato crop, for instance, which is sometimes, though not generally, spoken of as a root crop, is not a root but an underground stem called a "tuber," on which are carried a certain number of leaf buds called "eyes."

When speaking of root crops, turnips, swedes, mangold-wurzels are more generally understood.

TURNIPS belong to the *Cruciferæ*, and to the genus *Brassica*, which includes numerous species which all breed freely together if in each other's neighbourhood, so that to preserve the purity of race, no two varieties should be allowed to flower near each other or hybrids will be immediately produced.

The turnips are known to botanists as *Brassica rapa*, and count numerous varieties, divided into two classes according to shape—

(*a*.) The round or globe-shaped (*depressa*),

(*b*.) The tankard-shaped (*oblongata*),

and are generally distinguished by the colours of the tops of the bulbs, which are either purple, yellow, green, or white.

Here, of course, the term "bulb" is incorrectly applied to a root which is developed into a globular mass.

Turnips and swedes are to all appearances much alike. In turnips, however, the outline of the bulbous roots are more compressed than in the case of the swede. They are also paler in colour, and very hairy.

The flesh is also much softer in texture, less nutritious and white, and has a peculiar smell, which at times may taint the milk of cows which have access to them shortly before milking time. Soft turnips are grown on account of their very quick development, and come earlier in the autumn into use, before the swedes.

Two commonly grown varieties are—

The Common White Globe with a globular root, skin smooth and perfectly white, a remarkably large head, and a small tap-root. On rich soils, this variety has a tendency to develop itself to a great size, to become woolly in texture, less valuable in feeding value, and to exhibit a tendency to rot and deteriorate in the field. To counteract this tendency they are left fairly thick in the rows, say

10 inches apart. This gives fully as large a return per acre by the increased number of smaller roots, being more nutritive and less liable to injury than the larger ones.

The Tankard (*oblonga*) possesses a larger amount of surface, and is more exposed above the ground and is, in proportion, more liable to injuries both natural and artificial.

The Green Round has the upper part green and the lower part white.

Brassica campestris (Swedes).

The common characters are: the shoulders more sloping, the root longer from crown downwards.

There is a neck to which the leaves are attached. The leaves have smoother margins, and are of a dark bluish green colour. The flesh is much finer and darker. The specific gravity of the root is greater than in the case of turnip, and that is due to the presence of less air in the cells. Hence it is that swedes are, of all the varieties, the best for storing away, that the hybrids and yellows are superior to the white varieties, which have the lowest specific gravity, and contain the largest amount of air in their cellular tissue.

There are three important varieties of swedes:—

(1.) Purple-top.
(2.) Green-top.
(3.) White swede.

1. The common Purple-top is very extensively cultivated. It is hardy and a little apt to seed, unless severe frosts prevail during the earlier part of its growth. It is a good cropper. As its tendency is to strike deep into the ground, it frequently appears to be less of a crop on the field than it really is.

Shape, oblong; flesh, yellowish; colour, dull purplish at the upper part, and yellowish underneath.

2. Green-top Swede is now more limited in its area of cultivation. The skin or rind is rougher and gives a coarse appearance, which in general is less symmetrical in appearance than the purple-top varieties. The colour of the upper part is dull green, with yellow below.

3. The White Swede has all the character of the purple-top at first, but the flesh is perfectly white.

Besides *B. rapa* and *B. campestris* there are a numerous variety of crosses.

The soils best suited for the cultivation of turnips are those of a free-working loamy character, in which the most suitable conditions, chemical as well as mechanical, for the growth of the plant, are met with. The essentials of a turnip soil are: that it be deep, free from stagnant water, susceptible of minute division, and sufficiently tenacious to absorb and retain moisture sufficient for the wants of the plant, and that its general composition be such as to contain the mineral constituents necessary for its growth (especially potash).

Preparation of the soil shall commence immediately the field is free from the straw crop, by inducing as soon as possible the germination of the seeds of annuals and by thoroughly clearing it of the roots of perennials met with in the soil.

When the land has been properly cleaned and reduced by ploughing, rolling, and harrowing to the proper state, if ridges are to be made, the double-mouldboard plough is sent into the field and the land laid up in ridges at the desired distances apart—usually 24 to 27 inches.

The seeds must be new. Should the plants grow very rankly before the time of singling there is a danger of "spindling" or "blanching." In that case, bunch them out with the machine. They are singled out when they have about five leaves.

The medium sized roots are the best, the large and soft ones are sometimes cottony in the centre.

Soft turnips are fed off on the field by sheep or may be given to cows in the stables or the field. When first given to sheep, being softer than swedes, they can be given whole, whilst swedes have to be chopped.

THE MANGOLD-WURZEL CROP.

N.O.—*Chenopodeze.*
Genus—*Beta.*
Species—*Beta vulgaris*, or common mangold.

This plant, like the *Brassica* family, no doubt derives its origin from a littoral plant, the *Beta Maritima*, indigenous to climates of the temperate zone.

There are many varieties commonly distinguished by their colours, as red, orange, purple; by their shape, as globular or oblong.

The two most important are the Long Red and Orange Globe.

Long Red.—A productive variety; 30 to 50 tons per acre; root long, large, and fleshy; stands well (about one-third) out of the ground, but requires a deep friable soil for its development; the top is full and bushy; mid-rib and veins of leaves tinged with red.

The Orange Globe.—Very extensively cultivated; a hardy variety of a globular shape growing well out of the ground and of an orange tint externally, with a yellowish-white interior; a large cropper and suitable for growing on a heavier class of soils than the Long Red and a shallower one; it carries a good bold head, the leaves having their mid-rib and veins tinged with yellow.

The Yellows of the same shape are lighter coloured mangolds.

The Silesian beet, largely grown on the Continent. In appearance this greatly resembles the Belgian carrot rather than the mangold. It is white, either with or without a green top; long;

grows deep into the ground and has a far sweeter taste than the Mangold. Contains a larger per cent. of sugar, for which purpose it is generally cultivated, but its weight per acre, and consequently food produce, is far below an ordinary crop of mangolds.

The Globe varieties are best suited for strong clay loams or for shallow soils, as they perfect their bulk chiefly above the surface, and are more readily lifted at harvest.

The Long Red prefer soils of a medium strength and greater depth, as owing to the fleshy brittleness of the roots they are very apt to break off a portion of their lower end in the ground.

They both exhibit a vigour of growth and a power of production, under suitable conditions, greatly exceeding that of the turnip.

On the Continent, under the name of "Beet Root," it is much more extensively grown than in England, and forms the basis of an enormous and important industry—the manufacture of sugar.

In all root crops it is desirable that the soil be as finely divided as possible, and quite free from any obstacles that might obstruct the roots of the young plants, and induce either a distorted growth of the main root or a growth of lateral roots, which always diminish the bulk and value of the crop.

Common salt may be (1) mixed with the heaps of farmyard manure, or (2) broadcasted at the time of ploughing in, or (3) mixed with guano when sowing.

As it is not a costly article and acts very beneficially on most soils, especially those of a dry character, it is desirable to give a good dressing of it (5 to 10cwt. to the acre of mangolds, and also to the turnip crop).

TWENTY-SEVENTH LECTURE.

During the absence of Mr. Despeissis, who is now on a visit to Europe, Mr. P. G. Wicken, Field Officer to the Department of Agriculture, will continue these lectures, dealing chiefly with stock matters.

THE HORSE.

Early History.—The horse was domesticated by man 1650 years before the birth of Christ. The earliest record mentioned in Bible history was when Joseph took up the remains of his father to Canaan, it is said that they had chariots and horses. One hundred and fifty years after this horses constituted the principal part of the Egyptian army. The wild horse is said to be a native of Central Asia (the Arab) and Tartary (the Barb), but the origin is lost in obscurity. The wild horses of North and South America and Australia are simply those that have bred from horses imported and let loose in the early days, and are not indigenous to the country.

The Horse in Great Britain.—No record is recorded of the horse in Great Britain until 55 B.C., and until a comparatively recent period no mention is made of the horse for purposes of cultivation of the field, the ox being used as the beast of burden in the early ages. In the year 1121 A.D., the first Arabian horse was introduced.

Horses may be divided into two classes—draught horses and light horses. The draught horse is used for all classes of slow, heavy work. Of these horses there are a number of breeds, the principal being the Clydesdale, Shire, Suffolk Punch, Lincolnshire, and Percheron. The light horses include the Cleveland Bay, thoroughbred or racer, hackney, hunter. In addition to the above we have a number of breeds of ponies. These are distinct breeds, and, being very small, are really only of use for very light work. These are the Galloway, Welsh, Exmoor, Highland, and Shetland ponies.

THE CLYDESDALE.—There are two theories advanced as to the origin of the Clydesdale. The first, that the breed is the result of a cross between the native Scotch mares and some Flemish stallions, imported into Scotland by one of the Dukes of Hamilton some two centuries ago; the second, that it is a mixed breed, the reward of care and attention in the selection and mating of the best animals in the valley of the Clyde. The home of the Clydesdale is the valley of the Clyde, which traverses the county of Lanarkshire, and hence the name Clydesdale. Between 1715 and 1720, a man named John Patterson, of Loch Lyock, Lanarkshire, went to England and bought a Flemish stallion, and from that time the improvement of the breed dates. In 1784, on the formation of the Highland Agricultural Society, premiums were offered for stallions of this breed, and since then the breed has come into great prominence, and of late years several very high prices have been realised for horses of this breed. The fashionable colours are bay and brown. Grey is not in favour, and few entires are kept of this colour, unless very good otherwise. Chestnuts are not by any means popular, and in some districts Clydesdales of this colour would not be used for stud purposes. White markings are common, and regarded as a sign of purity of blood. Few Clydesdales of the present day are without white on one or all four legs, while a white star or stripe on the face is highly prized. Piebalds are, however, objectionable.

The Head.—He has a broad jaw, ending, as a rule, in a not very fine or well-tapered muzzle, but with large, open nostrils. His eye is usually full and vigorous, yet mild; his forehead broad and full between the eyes, while from the eyes the forehead tapers gradually upwards to the ears, which are long and active, and these denote good temper. The head is well set on the neck, which is strong, massive, and of medium height.

The Legs.—Good, sound legs and feet are most essential to all horses, and are good points with the Clydesdale. The back part, from the knee down, should possess a nice flowing fringe of silken hair, called the feather, which should spring from the very edge of the bone. Coarse, matted hair is very objectionable, and indicative of grease. The sinews of the leg should be thick and strong, thrown well back from the bone, and capable of being felt with the hand. The pastern should not be too straight. Short, upright pasterns always get worse with age and feeding.

The Feet.—Without well-shaped feet a horse is of no use at all, and the Clydesdale is noted for his good feet.

The Body.—The back of the Clydesdale should be of moderate length, not too long; the ribs should be well sprung, the hind quarters should be low and broad, with muscular thighs; the hock moderately straight, but not too much so. The average height of a Clydesdale is about 16 hands 2 inches (a hand is four inches). Some stallions are over this height, but this is a doubtful advantage.

A stud-book was published in November, 1877, and all thoroughbred Clydesdales should be entered in this book.

SHIRE HORSE.—A great rivalry exists between the Clydesdale and Shire horse. One breed is mixed up with another, and the Clydesdale owes much of its size of the present day to the Shire sires. The modern Shire horse is of great size, and is objected to by farmers and others on account of his having so much hair on his legs, as on wet land this gets clogged with dirt, and impedes his progress. The Shire is, as a rule, not so active as the Clydesdale, and is principally used for heavy carting work in the cities. He can pull heavy loads, but is slow in his movements.

SUFFOLK PUNCH, as name implies, is bred in county Suffolk. Principal characteristics are purity of blood. All horses come one colour; a Suffolk mare never has a foal except chestnut if served by a pure Suffolk stallion. Breeders can trace the Suffolk Punch pedigree back for 16 to 20 generations. Suffolk Punch horses are extremely hardy, and will get fat where Clydesdales and Shires would starve, and can perform a long journey on very little food. After a long day's work on a farm or in a waggon, when the heavier horses are tired out, the Suffolk Punch is comparatively fresh. They are smart, active, and can trot at a fair pace with a heavy load, and travel many more miles per day than the Clydesdale and Shires. Very few of this breed are in this State, but they are a stamp which would be very desirable.

LINCOLNSHIRE HORSE, as name implies, originally bred in county Lincoln. The colour is black; and this breed of horse is the tallest known. They are supposed to be a cross between the old black English mare and the Flemish stallion. They are much slower at work than the Clydesdale or Suffolk, but are much used for heavy dray work in London, where they move some very heavy loads on good roads.

THE PERCHERON take name from Perche, in France. Belongs to the draught horses of France, and have attracted much attention from breeders. They are much appreciated in America, where they have become great favourites. They weigh from 1,600 to 1,800lbs., and can trot for 20 to 25 miles very lightly, and at a good speed.

Their colour is spotted or dapple grey; they are very intelligent and handsome in appearance. Supposed to have originated from a cross between the Arabian horses captured and brought to France at the time of the Crusades, and the horses already in the district of Normandy. This breed exhibits great bone and muscle, and some extraordinary records are recorded of the work done by this breed, 58 miles being trotted in four hours one minute. He has extraordinary strength and vigour, and does not degenerate. He is elegant, docile, mild and patient, honest, and very hardy. His movements are quick, spirited, and light, and he does not get excited.

THE CLEVELAND BAY.—These are the old coaching horses which were used largely before the advent of railways. They are supposed to have originated in Yorkshire, and were of great service for fast work over bad roads. The large carriage horses used in London and other English cities are of this class. This breed of horses is not very plentiful at the present; but a few sires of this breed would do much to improve the quality of our medium-sized horses. Mr. Philip Charley, of Belmont Park, near Richmond, New South Wales, has of late years imported some of this breed, and has been most successful in the breeding, the young stock being quickly bought up by the police and military authorities at good prices for remount purposes. The height is 16 hands; the colour bay and free from markings.

THE RACER OR THOROUGHBRED.—Although racehorses may not be essential to a farm, still it is part of the business of a farmer to keep breeding stock, and the thoroughbred stallion will often become a source of great profit to him. England is the home of the racehorse. There is a great dispute as to the origin of the racehorse. Some say that he is a cross from the Barbary horse, others that he was crossed with the Turkish horse, and others with the Arab. All the old racers, however, can be traced to Eastern origin. The racehorse of the present day has been greatly improved in speed by careful selection and breeding. One of the oldest racehorses recorded in England was named "Flying Childers," in the year 1772. He was the property of the Duke of Devonshire, and is said to hold a record that has never been beaten (3 miles 6 furlongs in 6min. 40sec.). In regard to the records and prices obtained for racehorses, we cannot deal with them in the limits of our lectures. The racer is distinguished by his beautiful head, well set on neck, long oblique shoulders, and well bent hind legs.

TWENTY-EIGHTH LECTURE.

THE HUNTER.—Agriculturists, especially in the old country, have no love for the hunter. But, apart from the purpose of hunting, they are a useful breed of horse. They should be between 15½ and 16 hands high, the head small and well set on, the forequarters should be loftier than those of the racer, the barrel should be round and the chest broad, the arm muscular, both for strength and endurance, the body should be short and compact, and they should not take the extending stride of the racer.

The Trotter.—Trotting is the pastime of the American people. Many people believe trotters to be a distinct breed; others, that he is not a distinct breed or of very long existence. The power of trotting has been brought to the present stage by careful selection and breeding. The trotter has not that high, round step of other horses, but a long, far reaching stride. The fastest record for trotting is that of Maud S., who is said to have trotted a mile in 2min. 8¾sec., on 18th September, 1880. Trotters should stand from 15 to 15½ hands in height.

The Hackney.—The hack is a horse intended for the saddle. This horse is largely bred in England, and they attain great celebrity. The breed is said to have been produced by putting the Hunter to another English breed (the racer). The shoulder blade of the Hackney should be wide enough at the upper part, and sufficiently clothed with muscle to keep the saddle in its proper place. He should have a neat head and neck, and a general outline to please the eye. A good hack should walk five miles an hour, and long journeys are performed by cantering and walking alternately. A large number of hacks are bred in Australia, and these are largely purchased in the Eastern States for army remount purposes, and mostly sent to India, where they are generally termed "walers." Some few years ago the prices of this kind of horse became very low, and people gave up breeding; then came the demand for the Transvaal, on account of the war, and also for our own contingents, which has, coupled with the fact that foreign buyers have purchased all the suitable mares that they could get, made this class of horse rather scarce in the Commonwealth at the present time.

The Cob is merely a thick, strongly-made hack, low and strong, about 14 hands high, and fit to carry from 15 to 20 stone. The points of the cob are such as are required in the ordinary hack, and must be strong in proportion to the weight he has to carry. To give them a cobby appearance, a part of the trunk of the tail is cut and seared with a hot iron.

Ponies.

Galloway.—Originally, the term "Galloway" was confined to a full-sized pony, bred in the south of Scotland, in the county Galloway. A Galloway pony should be over 14 hands. They are clever, active ponies, but the breed is very much mixed up with other breeds at the present day. Colour: bright bay or brown, and generally with black legs.

The Welsh Pony is a strong, useful animal, averaging 13 hands in height. They have neat heads, good shoulders, capital backs, and most enduring legs and feet. Most of them are of cream or dun colour, and marked with a dark stripe down back, from mane to tail. This peculiarity is supposed to be the result of a Norwegian cross which were introduced to improve the breed in size and endurance.

THE EXMOOR PONY is bred on the Exmoor hills in Devonshire, a very hilly part. They are very hardy, and are never stabled. They are seldom over 12 hands in height; they have well-shaped heads and small ears; they are good jumpers, and can carry heavy weights. When pure they have a striking pecularity, in that the tips of the muzzle and legs are of a light colour. By crossing with the thoroughbred a large useful pony has been produced.

THE HIGHLAND Pony is remarkable for general docility and good temper: he can be taught to do almost anything. They range in height from 12½ to 13½ hands, and can carry a 6ft. man with ease. They are rough-looking, very hardy, and not much to be admired except their small neat heads.

THE SHETLAND PONY is the smallest variety of horse known; his head is almost covered with a shaggy mane and forelock. He is bred in the Orkney and Shetland isles. They vary in height from 8 to 10 hands, and are very useful for children. Their tempers are very good, and they will stand pulling about. The colours are chiefly bay, brown, or a rusty black; chestnuts and greys are extremely rare.

MULES.

Although mules are very little used in Australia they are largely used in the United States, and also in South America. The mule is produced by crossing the Jack donkey with a mare. The Spanish or Mexican ass is used to produce a short nuggety mule, and the Poiton ass for a larger, heavier animal. As is well known they have long ears, are very hardy, and are used for all classes of work except for very heavy pulling. They are not affected like the horse by bad water, and will keep their condition on a rougher class of food than a horse. They are credited with having great kicking propensities, but if properly broken in they are no more dangerous in this direction than a horse. Several of these animals have been used for farm work at Hawkesbury Agricultural College, Richmond, New South Wales, with very satisfactory results. The disadvantage of mules is that they are unable to propagate their species. There are nearly 2,000,000 mules at work in the United States of America at the present time.

AGE OF HORSE.

The Teeth.—A horse of five years old has a full mouth of teeth, *i.e.*, 40, but a mare has only 36. They are described as follows:—Six incisors above and below, two canines above and below, and 12 molars above and below. A horse has, therefore, 20 above and 20 below. By careful attention to the teeth, the age can be ascertained with accuracy up to seven years. At the birth of a foal he has eight interior grinders, followed a week after by two simple nippers; at about six months the six nippers are up. At the age of two years the first grinders give way to permanent teeth. At three years he should have the simple permanent nippers growing. At three and a-half and four years the next pair of nippers will be changed; and at four years the simple nipples are fully developed. The tushes make their appearance at this age, and are situated between the front teeth and the grinders. Horses only have tushes. Sometimes a mare has tushes, and if so she is a non-breeder. Between four and five the last important change takes place, the last nippers are shed, and the permanent ones begin to appear, the central ones being a little worn, and the next pair show signs of usage; the outside ones appear as soon as the corner ones disappear. At this stage the colt is called a horse, and the filly a mare. At five years old the mouth is perfect, the corner nippers are quite up with the long deep mark along them. At six years old the marks on centre nippers are worn out, and there will be a slight colour on centre teeth. At seven years the marks of four nippers are worn out; and at eight years the marks are entirely gone from all bottom nippers. The age after this cannot be accurately defined, but by close study of the mouth the age can be given within a few years. The general indication of old age is the deepening of the hollows around the eyes, also grey hairs appear about the head. Some horses live to great ages. Blair, a celebrated vet., mentions three horses that died at 35, 36, and 37 years of age. Another vet., Percival, mentions one dying at 62 years of age. The average age of the horse is about 20 years.

A horse belonging to Major Mass, of Louisville, Kentucky, is mentioned in a recent issue of the *Live Stock Journal* as 47 years old. He took part in the Mexican campaign in 1853. He has done no work for 20 years, has no teeth, and is fed on bran mashes.

FACTS IN REFERENCE TO HORSES.

Except under special circumstances, the mare should not be used for breeding purposes until four years old, as this spoils the the growth, and the progeny cannot have the stamina of that from a mature animal.

The period of gestation of the mare is 11 months.

The foal should suckle the mare for seven or eight months.

When a foal is weaned, he should be taken some distance from the mother, so that they cannot hear one another neighing.

The young foal should receive no check in his growth, and should be kept well fed, and if kept in a paddock in which a box of chaff is kept, he will soon learn to feed.

When about 12 months old, the male foal should undergo the operation of emasculation, but if you wish the animal to have a fine crest, he can be left until two years old. The operation should not be performed in either very hot or cold weather.

The feeding of a horse is another matter that requires attention, and as he only has a small stomach, he should not be taken too long journeys, or kept too long without food; five hours is the longest time a horse should be left without food or drink, and if on a journey, no time will, as a rule, be lost by stopping to feed your horse at the end of this time.

A draught horse in full work will require, on an average, 35lbs. chaff, 12lbs. oats, and 5lbs. of bran per day. The cost of this varies, but at present rates, represents nearly 3s. 9d. per day.

Wheat is not a good food for working horses, but is good for bringing on fatness quickly. Wheat tends to make a horse hard-winded, and they will sweat very soon. A little boiled barley in winter time, mixed with a little linseed oil, is good for a horse once a day.

A bran mash, made by mixing bran with warm water into a paste, and not too sloppy, is very good for a horse, especially if he has to be left idle for a day or two after being used to hard work. Carrots are very good for horses, and may be given with excellent results.

A horse should never be given a cold drink when he comes in heated; always let him cool down before being allowed to drink. Plenty of fresh, clean water should always be supplied at a stable, as the horse is easily affected by bad water, and appreciates a trough of good, clear water.

In driving a long distance, never push the horse for the first few miles; he will then perform his journey much easier, and probably in less time.

A gelding should not be put to hard work until he is five years of age; he will develop and grow until he is six years of age. A mare matures nearly a year earlier, and can therefore be put to work earlier.

The earlier a horse is handled, the better. He should be mouthed properly, but if this is neglected, he will always have an unsatisfactory mouth. In breaking in a horse, he should never be put in a crush. A quarter of an hour may be spent in leading him round the yard; and if he does not want to follow you, do not try to force, but try to encourage him as much as possible. After you are on good terms with him, put on the bridle. Before you put on the surcingle and crupper, let him get accustomed to the bit. The bit should not go on for more than four or five hours each day; and after four days (tightening up each day) you will probably have a splendidly mouthed horse.

A draught horse, after being mouthed, should be driven with reins by two men, one on each rein; after this the harness may be put on—the collar, and then the hames and traces. It is best to put on a set of leading harness, so that if he kicks he will not kick the swingle tree. You can now hook him on to a log to drag about, and after that to a set of light harrows, with some quiet horses, for a few hours. When learning him to plough, he should be made to walk in the furrow first; if this is not done, he will never take kindly to it after, and often spoil your ploughing by walking on the ploughed ground. Only work him half a day at a time for the first few weeks. After a few times in the harrow or plough, the cart harness may be put on, and you can take him on the roads for a few hours with a light load, and his education will be almost completed.

The number of horses in Australasia in 1901, the last year for which returns are available, is 1,904,822, of which Western Australia has only 73,710.

The class of horse required for army purposes, and for which there is a good demand, are graded as follows:—

Heavy Cavalry.—Upstanding horses of good bone and substance, and with exceptionally strong back and loins. They must be from fifteen hands two inches to fifteen hands three inches high, and be able to carry seventeen stone.

Light Cavalry.—Horses similar to above, but lighter in conformation, yet up to fifteen stone. Height, fifteen hands to fifteen hands two inches.

Mounted Infantry Cobs.—Stout, active cobs, with strong back and loins, and powerful shoulders and hindquarters. They must measure eight inches below the knee, and be up to fourteen stone. Height, fourteen hands two inches.

Horse Artillery.—Horses somewhat similar to the heavy cavalry horse, but in conformation more suitable for harness work. They must be equal to any pace. Height, fifteen hands two inches to fifteen hands three inches.

Field Artillery.—Active draught horses, equal to trotting six miles an hour in team drawing one ton, and maintaining that pace. They must have weight and substance, good colour, deep chest, short legs showing plenty of bone, and good feet. Height, fifteen hands two inches to fifteen hands three inches.

Army Service Corps.—Active heavy draught horses, about fifteen hands three inches high. Occasionally useful horses a trifle higher are taken under this class for special heavy draught work.

TWENTY-NINTH LECTURE.

CATTLE.

The word cattle is a term applied to all domestic animals—cows, horses, sheep, goats, mules, asses, swine, etc.—but is generally used in speaking of the ox tribe. They belong to the class Mammalia—animals having teats and suckling their young.

The ox tribe are of the order Ruminanta, *i.e.*, animals that chew the cud, and the genus *Bos.* This genus is divided into two classes—the hump-backed cattle, called *Bos indicus,* which are indigenous to India and Africa, and the *Bos taurus*, or common cattle.

Cattle appear to have been among the first of domesticated animals; they were domesticated from the time of the ark, and they have been a most important factor in the growth of early civilisation. The ancient ox was a much larger animal than that of the present day, and in early history wealth was measured by the number of cattle. The total number of cattle in the world at the present time is about 320,000,000, and if valued at say, £5 per head, this represents a great amount of wealth.

Cattle may be divided into two classes—the beef breeds and the dairy breeds. The beef breeds being those who convert the bulk of their food into beef, and the dairy breeds those that convert it into milk.

The principal beef breeds are the Shorthorn, Longhorn, Hereford, Devon, Sussex, Polled Angus or Aberdeen, Galloways, Red Polled, or Norfolk.

The dairy breeds are Ayrshire, Jersey, Guernsey, Holstein—milking strain of Shorthorns, Kerry, Welsh, and Brittany.

THE SHORTHORN OR DURHAMS.—Nothing is known of the origin of Shorthorn cattle before 1780. About that time, two brothers, Robert and Charles Collings, sons of a farmer on the Tees River, started cattle breeding. They were active, energetic young men, and are said to have been the first to produce this breed of cattle. Durham, Teeswater, and Shorthorns are all the same breed. The great progenitor of Shorthorn cattle was a bull named "Hubbuck"; he was sold as a steer to the brothers Collings for £5. All well bred Shorthorn cattle should be able to trace their pedigree back to this animal, his number is C.H.B. 319 (Coates' Herd Book). The brothers Collings gave up breeding cattle about 1818, and sold their herd, and then Thomas Booth and Thomas Bates took up Shorthorn breeding; they were both large purchasers at Collings' sale.

Booth and Bates cattle were bred from the same stock, but in 10 years' time there was great rivalry between the two breeds. They were known as the Booth and Bates cattle, and each had its advocates until a man named Cruickshank crossed the two breeds, and thereby produced the finest cattle of the world—the Shorthorn of the present day. In America the Cruickshank breed are largely bought at the present day. Thomas Booth died in 1864, at 86 years of age; and cattle breeding about this time became more general. Thomas Bates died 24th July, 1849.

Booth cattle are plainer in the head, coarser in the horn, and not so easy to handle. The Bates cattle are better milkers, and have fine coats. Booth cattle are heavier, but not such fine beef as Bates and have great robustness of constitution. Some extraordinary prices have been obtained for Shorthorn cattle.

A cow, "Tenth Duchess of Geneva," fetched 7,000 guineas in America, and was bought by the Earl of Dunmore. A bull, "Duke of Connaught," fetched 4,500 guineas in England, and was purchased by Lord Fitzhardinge. Coates' Herd Book was established in 1832, and they publish one volume every year. It contains the pedigree of all pure bred Shorthorns in Great Britain and Ireland.

The Shorthorn was introduced into Australia, in 1832, by the Circular Head Company of Tasmania; and at the present time there are some splendid specimens of Shorthorns bred in Australia. Messrs. Angus Bros., of South Australia, are the leading breeders of Shorthorns. Mr. A. W. Edgar, of Strathalbyn, Gingin, in this State, has some splendid animals. Several instances are recorded of over 2,000 guineas being obtained for animals of this breed in Australia.

The leading characteristics of the breed are:—Colour: any variety of red or white, roan, or a mixture of these colours, is considered correct. The nose should never be black or smutty; it should be cream or light colour. The muzzle should be broad, flat, and dewy; the forehead short and broad; eyes prominent, bright, mild, and lively; a handsome horn, thick at the butt, and tapering to a point, evenly bent towards the brow. The shoulder well developed, and well covered with muscle; the knee should be broad in front, and the barrel of the body well sprung; the loins full, long, level, broad, and well covered with flesh; the rump should be long and wide, and well covered on the top with flesh; a perfect "touch" will be found in a loose layer of skin, as if it were floating on fat, yielding to the least pressure. They should show their sex well.

LONGHORN CATTLE.—There still exists a race of Longhorn cattle, with a registered herd book. They are mostly in the midland counties of England, and there are 80 names of breeders in the herd book. A bull named "Shakespeare," at Mr. Paget's clearing sale in 1793, realised 400 guineas at auction—a large price in those days. A Mr. R. Bakewell let a bull, in 1792, for 152 guineas for four months. A steer by "Shakespeare" when slaughtered, weighed 1,988lbs. meat, 200lbs. tallow, and the hide weighed 177lbs.

Robert Bakewell was a celebrated breeder of Longhorn cattle, as well as Leicester sheep. They are sometimes known as the Leicester cattle, but are very little bred at the present day. The principal herd at the present are said to be at Chillingham Park, in county Northumberland.

HEREFORDS are a pure bred race of cattle, originating in Herefordshire; they cannot be traced further back than 1766. The great improver of this herd was Benjamin Tomkins, born 1745, died 1815; he started with two cows, which he got with his wife.

The Herefords were, at this time, red or brown, with no white about them; but about 1780 they commenced to breed them with white faces, and then white along the back, and then the brisket and forelegs, the belly and flank, hind feet and tail.

Tomkins kept a correct record of his breed, and the best breeds of Herefords can trace back to his herd. About 1798 there was a desire to test the various breeds of cattle together, and the first show was held at Smithfield in 1799, and the Herefords carried off the champion prizes for 20 years. After that the Shorthorn and Polled Angus came to the front. If there is abundance of succulent herbage, no cattle will give a better return than the Shorthorn, but he must be well fed; if sparsely grassed country, the Hereford is better, they will travel long distances and arrive at their destination in good condition.

The head of the Hereford should be small in comparison to the body; the face, throat, chest, lower part of body, legs, crest, and tip of tail all clear white; the chest deep and full, bosom very prominent; shoulder blades should be thin, flat, and sloping, well covered with flesh; chine and loins should be broad; hips long and moderately broad; legs straight, short, and near the ground; bone very fine; rump should form a straight line at the back; the thighs should be full of flesh to the hock; a well-sprung rib, and a deep flank. The offal of the Hereford is very small, in comparison.

DEVON CATTLE OR RUBIES.—County Devon has long possessed a breed of this kind of cattle; they are celebrated for general beauty, compactness, and activity as workers, and their aptitude to fatten. The breed is one of the purest in existence, and can be traced back further than any other, but the great improvement in the breed commenced about the year 1776, and a Mr. Quartly, of Molland, North Devon, was the first breeder to greatly improve the breed. Devons have carried off the Smithfield Challenge Cup of 100 guineas twice in four years. The Devon has a beautiful, soft, curly coat, and their colour varies in shade from dark red to pale red, but always red; the skin is elastic, and the bone usually small; and the offal of the Devon is small in comparison to the Shorthorn. The horns are of intermediate size, and pointed; countenance cheerful and pleasing, and possessing a deer-like appearance; the eyes are full, round, and clear. They are splendid active workers, and are very useful for team work. They fatten quickly, and the flesh is of excellent quality; being small they are often called the pony of the ox race. Although the Devon is not classed as a dairy cow, the milk is of a rich quality, and some excellent records are reported from this breed. There is a Devon herd book.

SUSSEX CATTLE take their name from county Sussex, and have many points of resemblance to Devons. They are larger, and have less refined appearance; the bone is considerably coarser; they are brownish red in colour, and not deep red like the Devons. They are very hardy, and capable of taking on condition on poor pasture, and are highly valued in their own county, although not much bred elsewhere. They have been greatly improved of recent years, and are essentially a beef-producing race, and of little use as milkers.

WEST HIGHLAND CATTLE is a horned, beef-producing breed of cattle, and have obtained considerable celebrity in the English shows. They are the native breed of the West of Scotland. They are compact, active, of fearless courage, and good workers; they are of small size, with a shaggy coat of hair, long and sharp-pointed horns, colour generally black, but sometimes brindle or dun colour; their hides are thick, but soft; extraordinarily hardy in constitution, and celebrated for their finely-flavoured beef; they have straight backs, and all the points of a good beef producer.

POLLED CATTLE.

POLLED ANGUS OR ABERDEEN.—They originated in the county of Aberdeen in Scotland. Mr. H. Watson of Keiller, in Forfarshire, was the great improver of this breed of cattle. He was born in 1780, and became tenant of a farm in 1800. From boyhood he was fond of the black hornless cattle of his county, and devoted his energies to their improvement. He received from his father six of the blackest cows and a bull, he had. He was a man of accurate judgment, and went in for in and in-breeding; he gave great attention to preparing his cattle for the show ground, and achieved great success; the lists of awards obtained by him was over 500 in England, Scotland, Ireland, and France; and among the celebrities bred by him was a cow named "Grannie"; she lived 35 years and produced 25 living calves, and was killed by lightning. The next improver was Mr. H. McCrombie, of Tillyfor. He was the first tenant farmer that ever entered the House of Commons. The direction of his improvements were symmetry, fineness of bones, size, and aptitude to fatten. In 1867, at Smithfield, his famous polled ox, the "Black Prince," carried off the Smithfield Challenge Cup for the best beast in the yard. When killed and dressed he weighed a ton of meat. In the Paris Exhibition, in 1856, Mr. McCrombie won the great gold medal of France for the best group of beef-producing cattle, and also won it again in 1878.

The following points of excellence are claimed for this breed:—Their distinctness of type; their gentleness is remarkable, the absence of horns in the bull destroying much of their quarrelsomeness, the absence of horns also renders their transit by rail comparatively safe, and is an assurance against many accidents to which horns are liable; the quality of the meat excels anything that comes to the London market, and fetches the highest price. They look smaller than Shorthorns, but in the scales the difference is not great. Their colour is jet black; and they give rich milk, although not in large quantities. An attempt was made to establish a herd book in 1851, but the whole matter, which took six years to collect, was destroyed by fire and the first volume did not appear until 1871.

GALLOWAYS OR POLLED SCOTS resemble in a marked degree, at first sight, the Polled Angus. They originated in the district of Galloway. It is believed one is as far removed from the other as any other British breeds. They are handsome cattle, all black in colour, the same as the Polled Angus. They have long, wavy coats, and are much coarser in the hair, excellent grazers, but do not fatten well, and mature much slower than the Polled Angus. They are exceedingly hardy, and resemble the West Highland cattle minus the horns. No one stands out as being a great improver of this herd, but of late years the Rev. J. Gillespie has done much to improve this breed. Robert Burns and the Duke of Buccleugh were both breeders of this cattle. The difference between this breed and Polled Angus is mainly in the appearance of the hair, which is much rougher; they may be classed as second-rate cattle, and are poor milkers.

Red Polled or Norfolk Cattle.—A large number of Polled Galloway cattle used to be purchased years ago by Norfolk graziers to fatten for the London Market, and it is supposed that some of these were retained for breeding purposes and crossed with their own breed of horned cattle, and produced a race of hornless cattle. Hewett, an authority on cattle breeding, says that they have undoubtedly sprung from Galloway cattle. The Red Polls retain much of the general form of their ancestors; they are larger than the Galloways, and all red; no markings whatever are allowable. They are very handsome cattle, and have considerably improved in late years. A very fine herd of this breed is in the possession of Mr. P. Charley, of Belmont Park, Richmond, N.S.W., who imported, on several occasions, some very fine specimens of these cattle, and has taken a large number of prizes at Sydney and the principal shows in New South Wales.

The Suffolk are a breed very similar to the Norfolk.

Both these breeds show great aptitude to fatten, and are noted for their good beef-producing qualities; they are also very fair milkers, and are what may be termed "general purpose cattle."

INSECT AND FUNGOID PESTS.

Treatment and Remedies.

Until of late years little or no attention was paid to the damage caused by insect and fungoid pests to cultivated crops.

In the old days of farming and fruitgrowing pests were regarded in the light of an unavoidable calamity, and a visitation of Providence; their nature was shrouded in mystery, or they were either entirely unknown in some parts of the world, or else were often met with, under a mild form, in certain localities; a great many, by transplantation to surroundings somewhat dissimilar to those by which they were influenced in their original *habitat*, have subsequently developed more pronounced and distinct characteristics, and have consequently forced themselves to the notice of cultivators.

These so-called new pests, either insects or fungi, are as ancient as the world, and although they are greatly influenced by their immediate surroundings, by the food at their disposal, the climate in which they live, by the enemies they have to contend with, and by many other circumstances of various nature, they nevertheless spring from parent individuals in every respect like themselves. The devastating phylloxera, for instance, or the woolly aphis of our days did not originate as spontaneously from the roots of the vine or of the apple tree, but are the descendants, in a direct line, of a long list of ancestry of lice of these respective tribes. In a similar manner, the rust of cereals or the oïdium of the vine have no more budded from the wheat plant or the grape vine than potatoes are transformations of the soil, but have simply grown from seedlike germs produced by preceding pests of the same kind.

Every season, almost, we hear of the appearance of new pests, and it is more than likely that, for a great number of years to come, the list, already formidable, of the sorts of insects and fungi that invade and prey on our crops will gradually be made longer still, by the addition of more unwelcome enemies.

Various factors combine to bring about this undesirable state of things.

In the first instance, we have seen that new conditions of life may develop propensities of a distinctive nature; or, again, the partial extermination of some parasites of these pests, either owing to unfavourable surroundings or the use of insecticides, by breaking the balance of nature, may insure the preponderance, to an alarming degree, of certain species of pests. By the constant and more rapid interchange, on the other hand, of plants, fruits, seeds, and cuttings of all sorts of ornamental, economic, or useful plants, from all parts of the world, many of the parasites of plants have been widely disseminated, without, in a great many instances, their own particular parasites having been brought with them; and thus the appearance of hitherto unknown pests is accounted for in countries until then free from them.

For, as it is so concisely expressed in Dean Swift's oft quoted couplet :—

> The little fleas that do us tease
> Have other fleas that bite 'em ;
> And these, in turn, have other fleas,
> And so on *ad infinitum.*

To ward against the importation of noxious pests, the Government of Western Australia, profiting by the errors and the experience of older fruit-growing countries, have passed a Fruit Pest Act, reproduced, as an appendix, in the *Handbook of Horticulture and Viticulture,* and which provides for the disinfection, on landing, of plants and fruits, for the purpose of checking any possible importation from abroad of pests inimical to fruit trees and vines.

Amateur gardeners, as well as professionals, who concern themselves about the wellbeing of their plants, have continuously to contend with two classes of pests which injure their crop. The first of these are *noxious insects*; the second, *parasitic fungi*.

Insects vary greatly in their shape, size, and colour, but on broad lines they all possess, when seen in their full-grown stage, certain features which differentiate them from other animals. They possess three pairs of legs, attached to a body divided into three definite portions—a head, a thorax, and an abdomen.

Some of them—indeed, the majority—undergo during their development well-marked transformation or stages: 1st, the egg; 2nd, the larva or caterpillar; 3rd, the pupa or chrysalis; 4th, the adult or imago stage. Moths and butterflies, amongst others, belong to this class. In two or, may be, three periods of their transformation they take no food, and are fixtures; during these periods they do no actual harm. Thus, butterflies and moths are inert in the egg as well as the pupa stages; and some of them, such as the codlin moth for instance, do not feed. Yet it is during these periods of rest and transformation that it is often easier to attack them. These insects undergo what is called *complete transformation*, in contradistinction of others which undergo *incomplete transformation*. This second class, such as grasshoppers and locusts, have eggs which, in hatching, give forth young insects which only differ from the full-grown ones in size and in possessing no wings. Instead of changing from larva to pupa, they proceed, by a series of moulting or casting off their skin, to the mature stage, and become imago. During these successive moultings they are known as "nymphs."

Again, some insects lay eggs, and are "oviparous"; while others bring forth their young alive, and are "viviparous." The majority of them, however, proceed from the egg, whether that egg is deposited and cemented to the plant by means of a viscous secretion or whether they give birth to young ones. In the latter case the female insect generally carries the egg internally until the hatching period arrives.

So much for the life history of insects, considered broadly. A number of varieties depart from the pattern laid down in several minor details which cannot be touched upon in this paper, although a clear understanding of these particularities is of great assistance in combating pests. They often constitute the weak point of the armour it is meant to penetrate, and serve as a guide in directing the attack against them.

Almost as important as an undertaking of the life history of pests is a knowledge of the manner they attack plants when taking their food.

In that respect noxious pests may be considered, irrespective of their classification, names, shape, or colour, into two general types: *biting or chewing insects* and *sap-sucking insects*. The former are often leaf-eaters or bark-nibblers, or, again, wood and fruit borers. They are provided with jaws by which they can gnaw the surface of the food-plant, and chew it.

The latter feed on the juices of the inner tissues of the host-plant. They are armed with a pointed tube-like beak, which they thrust into the tissues of their host-plant, and suck out the sap.

Of the biting or food-chewing insects, some are:—

(1.) Root-eaters; such as the white worm of the cockchafer; the larvæ of the cicadæ.

(2.) Others, bark-nibblers; as certain kinds of beetles and of weevils.

(3.) Some are leaf-eaters; as slugs, caterpillars, saw-flie's larvæ, the carpenter bee.

(4.) Others injure the bud, the blossom, or the fruit; as the strawberry weevil, the codlin moth.

Of the sucking insects, in a like manner, some are:—

(1.) Root-sucking insects; as the woolly aphis and phylloxera of the vine.

(2.) Others, ordinary bark-sucking insects; as the mealy bugs.

(3.) Some leaf and bud or fruit-sucking insects; as the rose and the orange aphis, the red and other scales, and plant bugs.

When fighting against biting insects, their food plant is best coated with substances which will act as internal poisons; whereas, when directing the attack against sap-sucking insects, the treatment must be such as hurts and kills by direct contact; they are external irritants, and act from the outside, either closing the breathing pores or killing by irritation of the skin.

To the first category belong the various combinations of arsenic, and chief amongst them "Paris green," a chemical combination of arsenic and copper. When unadulterated it contains 55 to 60 per cent. of arsenic. It is almost insoluble in water. It is applied either—1st, dry in a state of impalpable powder, mixed in the proportion of 1oz. of Paris green with 2lbs. flour, slaked lime, road-dust, or ashes; 2nd, or in a liquid mixture in the proportion of 1oz. in 10 gallons of water. It should not be used in conjunction with any acid substance which would dissolve the arsenic it contains and make it caustic, but, on the contrary, it is always a good plan to add to it a handful of lime, which has the property of turning insoluble any trace of caustic arsenic it contains. Being a heavy substance, it quickly settles to the bottom of the pumping tackle, and requires agitating.

Other combinations of arsenic, such as London purple and arsenic and soda solution, are also used; but genuine and unadulterated Paris green is the best. A little glue or flour paste may be added, to cause it to adhere better, especially to plants with glossy leaves.

Hellebore, unlike the arsenites, which are mineral poisons, is a vegetable poison, and is less dangerous. It is a powder made of the roots of the white hellebore, and kills both by contact and by being eaten. Very effective when fresh, it loses its strength by standing. In doses 1oz. to three gallons of water it is much used against the pear slug and leaf-eating worms.

Pyrethrum, or Insectibane, is also a poison, and is effective when fresh, but loses strength when exposed to the air. It is made from the powdered flowers of plants of the genus Pyrethrum. That light-brown powder is dusted over the plants or sprayed, in the proportion of Pyrethrum one tablespoonful, boiling water two gallons. It kills by contact, and should be applied as long as the insects persist. Burnt over hot coals in the conservatories and greenhouses, it rids plants of aphis and other insect pests. Pyrethum are easily cultivated, make pretty borders, and a supply of fresh flowers could, without trouble, be raised in every garden.

Kerosene, in the form of an emulsion with soapsuds, or mechanically mixed with water in the form of a misty spray, in the proportion of one of kerosene and four of water, will kill nearly all insects, and not injure the foliage.

Resin Compound is known to be very effective against scale insects. One of the best formulas is: caustic soda, one pound; resin, five pounds; water, 25 gallons. Two ounces of Paris green may be added to this when used.

Sal Ammoniac (chloride of ammonia) at the rate of ¾ to 1oz. per gallon of water, is a cheap and efficacious spray against red scale.

Tobacco is one of the safest and most valuable insecticides, and may be applied in several ways; either as a fine dry powder against slugs and aphis, or as a decoction of three to four gallons of water to one pound of tobacco; or in fumes, when burnt in the greenhouse.

Carbolic Acid, especially in its crude state, is a valuable insecticide as an emulsion made by mixing one quart soft soap, or about one pound of hard soap dissolved in two gallons of boiling water, and then adding one pound crude carbolic acid; and, applied with a cloth or a brush, it is efficacious in preventing the attack of tree borers. It must not, in that state, be applied to the foliage.

Bi-Sulphide of Carbon, a very volatile fluid, the fumes of which are destructive to all animal life, is used for killing insects underground; this is done when the plant is dormant, by boring a hole into the ground and pouring in a little carbon bi-sulphide and kerosene mixed. It is highly inflammable.

Coal Tar is excellent to drive insects away, or entrap them.

Hot Water, at a temperature of about 125 deg. F., is very efficacious for killing plant lice. Amongst other substances which are used against insects must also be mentioned lime and gas lime, quassia chips, kainit, fir-tree oil, sulphate of copper.

Natural Checks.—Although economic entomologists have already tested many valuable insecticides, and so compounded them that they kill insects but leave plants uninjured, yet there is, in keeping noxious insects in check, even more efficacious allies than the spray pump and the insecticidal mixtures.

All insects, injurious or beneficial, have many natural enemies of their own to contend with. Some are of a higher order in the scale of animal classification, such as lizards, frogs, and other reptiles; birds, moles, etc. Others, more numerous, belong to the insect world itself.

Amongst these, some which attack noxious insect pests from the outside, and either devour them or suck their vital juices, are called *predaceous* insects, *e.g.* ladybirds, spiders, soldier bug, black ground beetle.

Others, called *parasitic* insects, differ from the predaceous ones, in so far as they live inside the bodies of their victims, and ultimately kill them. Amongst these parasitic insects the more numerous are ichneumon wasps, which entomologists classify amongst the hymenopterous, or four-wing flies. Another class of flies, with only two wings, and for that reason known as dipterous insects, contribute largely to the ranks of insect parasites.

But even these parasites are frequently subject to the attack of still smaller parasites, which prove as fatal to them as they did to their insect hosts. The first of these parasites are, for that reason, known as primary parasites, to differentiate them from the second, called secondary parasites. When introducing parasites into an orchard or a garden, therefore, it is of the greatest importance that we should have a clear idea whether we are introducing an ally which will prove beneficial, or whether we will add to the list of our pest enemies another insect which will prove mischievous. Such a work is better left in the hands of experienced people, and may prove a dangerous tool in those of the tyro gardener.

Besides insect parasites, injurious insects are also attacked by even more minuscule foes. These are germs of contagious diseases, which, at times, stop an insect plague with remarkable suddenness.

These germs are of two orders: some bacterial and inward, *e.g.* green potato and tomato caterpillars; others, superficial, cover their victims with silklike threads, and belong to the mould family, *e.g.* the African locust fungus—the housefly fungus.

GARDEN AND ORCHARD CROPS—THEIR PESTS AND REMEDIES.

In a tabular form, I have grouped those insect and fungoid pests which attack our orchard and garden crops. A few words concerning the more prominent amongst these pests will follow.

GARDEN AND ORCHARD CROPS—THEIR PESTS.

NOTE.—Pests marked thus * have not so far been observed in Western Australia. The intensity of the disease will regulate the frequency of the treatment.

PLANT.	DISEASE.	DIRECTIONS FOR APPLICATION.
APPLE	Scab (*Fusicladium*)	Before buds start, Nos. 1, 2, or 6. Before blossoms open, No. 3. When fruit sets, No. 3. End of the year, Nos. 3 or 4. Later on, if necessary, Nos. 3 or 4.
	Monilia or Mummification	Gather fruit left hanging, and burn. Burn gummy degeneration of wood. Wash stems before spring with 10 per cent. solution sulphate of iron. Follow up with No. 3.
	Bitter or Ripe Rot	Collect and burn diseased fruit. When fruit is fully grown, every 15 days Nos. 3, 4, or 15.
	Bitter Pit	Before buds start, No. 1. When fruit sets, No. 3. When fruit is fully grown, Nos. 3 or 4. Sub-drain and fertilise with lime and potash.
	Mouldy Core	When fruit is fully grown, Nos. 3, 4, or 15.
	Water Core	More prevalent in moist seasons, especially in early sorts: not very injurious.
	Powdery Mildew	Before buds start, Nos. 1 or 2. Every 10 or 12 days in infested nurseries, Nos. 3 or 4. In summer, sulphur.
	Canker	Cut back and burn diseased branches. Apply Nos. 6 or 9.
	Sun Burn	Low Heading, apply No. 9 on stem and main limbs.
	Fumagine or Sooty Mould	Remove scale insects and fumagine will cease. Apply No. 14. Starch, ¼lb. in hot water, 1 gallon, will, when dry, peel off and leave tree clean.
	Woolly Aphis	In winter, Nos. 6, 10, 14, or 20. A fortnight after, Nos. 10 or 14. Use blight-proof stock, and No. 9.
	Black Aphis	At first appearance, Nos. 7, 8, 14, or 18.
	Red Spider and Mites	Clean cultivation. In winter dress limbs with No. 6. Later on, 15, or powdered sulphur. Two or three dressings during spring and early summer.
	Codlin Moth	Clean all loose bark away. Use and visit cloth traps round trunks. Spray Nos. 12 or 13 before and after blossoming.
	Cut Worms...	Towards the close of the afternoon place a little lump of No. 16 close up to the tree or plant. A ring of kainit round plants acts as fertiliser as well as repellant.
	Scale Insects	In winter Nos. 6, 10, 14, or 20. Two or three applications at frequent intervals if necessary. Hydro-cyanic gas treatment.
	Leaf-eating Insects	Nos. 11 or 13 whenever necessary.
	Bud and Bark-eating Beetles	Shake tree in the cool of the morning, and collect insects on sheet of brown paper or calico. Spray with Nos. 11, 12, or 13.
	Borer	Look on dying or dead limbs for excreta indicating the presence of borers. Plug holes with probe dipped in carbolic acid and tar. Cut off and burn badly injured branches. Use No. 9.
	Fruit Fly	Carefully pick and burn all affected fruit before grubs leave to pupate in the ground.
	Moss and Lichen	Whitewash or spray with Nos. 1 or 6.

PEAR	Scab	Same as for Apple Scab.
	Phytoptus (Mite)	Same as Red Spider and Mites on Apple.
	*Pear Slug	Wait till slugs appear and then use Nos. 11, 12, or 13.
	Codlin Moth	*See* under Apple.
	Red Spider	*See* under Apple.
	Aphis	At first appearance, Nos. 7, 8, 14, 18, or 20.
	Scale Insects	*See* under Apple.
	Leaf-eating Insects	Nos. 11, 12, or 13, whenever necessary.
	Bud and Bark Nibbling Beetles	*See* under Apple.
	Fruit Fly	*See* under Apple.
CURRANT	Scale Insects	*See* under Apple.
GOOSEBERRY	*Mildew	Potassium sulphide (liver of sulphur), ½oz. to 1 gallon of water, every two or three weeks.
ALMOND **APRICOT** **PEACH** **NECTARINE** **PLUM**	Leaf Rust	Collect and burn diseased leaves. In spring and summer, Nos. 3 or 4.
	Shot Hole	Collect and burn diseased leaves. Before buds burst, No. 1. When fruit is set, No. 3; later on No. 4.
	Gumming	Pare off with knife and gouge out diseased wood. Paint over with shellac or other protective cover after swabbing with carbolic lotion.
	Curl Leaf	Before buds burst, Nos. 1 or 6. When fruit is set, No. 3.
	Black Peach Aphis	In winter gas lime, kainit, fresh manure, or No. 15 round stem. In spring, Nos. 7, 8, 14, 18, or 20.
	Other Aphides	In spring and summer, Nos. 7, 8, 14, or 18.
	Leaf-eating Insects	Nos. 11, 12, 13.
	Bud and Bark-eating Insects	*See* under Apple.
	Scale Insects	In winter, Nos. 6, 10, 14, or 20. Repeat applications two or three times, or use No. 18.
	*Slug	*See* under Pear.
	Borers	*See* under Apple.
	Red Spider and Mites	*See* under Apple.
	Fruit Fly	*See* under Apple.
	Sour Sap	Liberally fertilise with superphosphate of lime. Cut hard back when first signs of wilting show in spring. Paint with No. 9.
CHERRY	Leaf-eating Insects	*See* above.
	Bark-eating Insects	*See* above.
	*Slug	*See* under Pear.
	Borers	*See* under Apple.
	Gumming	*See* under Peach.
	Fruit Fly	*See* under Apple.

Garden and Orchard Crops—their Pests—*continued.*

Plant.	Disease.	Directions for Application.
Lemon, Orange, and other Citrus Trees	Mites	*See* above.
	Melanose	Prune away diseased parts and burn. No. 3 with a little soap to facilitate wetting of the leaves when the fruit sets, and again when half-grown; Nos. 1 or 2 before blossoming.
	Maori or Mites	Nos. 7, 15, or powdered sulphur.
	Black Aphis	Nos. 7, 8, 14, or 20.
	Scale Insects	*See* under Apple. Protect ladybirds and scale parasites. Hydro-cyanic gas treatment. Omit No. 6.
	Leaf-eating Insects	*See* above. For Red Scale: Sal Ammoniac, ¾oz. to 1oz. in water, 1 gallon; spray two or three times at a fortnight's interval.
	Bark-eating Insects	*See* above.
	Crown Rot (*Mal di Gomma*)	Avoid deep planting, stagnant water; pare off with a knife; swab with carbolic lotion and paint over; avoid organic manures; sometimes caused by crickets hidden in mulching. Avoid lemon stock.
	Die Back	Often due to excess of organic nitrogenous manures. Often seen on peaty soil. Drainage. Fertilisers. Nos. 1, 2, or 3, if due to fungoid parasites.
Loquats	Black Spot (*Fusicladium eriobotryæ*)	Cut off and burn all desiccated, diseased fruit. Nos. 1 or 15 at a week's interval after fruit has set.
Beans	Aphis	Spray with Nos. 7, 8, 9, 14, 15, 19, or 20.
	Leaf-eating Insects	Spray with Nos. 9, 10, or 11, whenever necessary.
	Anthracnose	*See* Peas.
	Bugs	Hand picking.
Beet	Leaf-boring Fly	Pick off and burn affected leaves.
Cabbage Cauliflower Radishes Turnips	Aphis	Spray with Nos. 7, 8, 10, 14, 15, 19, or 20.
	Moth and Caterpillar	Spray with Nos. 11, 13, or 19, or sprinkle with Paris green, 1oz., in flour or lime, 5lbs.
	Boring Moth (Ball Head)	Cut and burn as soon as noticed.
	Leaf-eating Insects	Spray with Nos. 11 or 13.
	Slugs	*See* below.
	Stinking Head of Cabbage	Caused by a yellow bacterium. Rotation of crops. Suppress cruciferous weeds, destroy slugs and cabbage-feeding caterpillars.
Fig	Fruit Bugs	Hand picking.
	Scales	*See* above.
Mulberry	Fruit Bugs	Hand picking.
Olive	Scale Insects	*See* above.
	Fumagine	Remove scale insects and fumagine will cease.
Onion	Thrips	*See* Red Spider and Mites under Apple.
	Rust	Spray with Nos. 1, 2, or 4.
Peas	Anthracnose	Sow clean seeds, or pickle them in bluestone solutions like wheat. Burn diseased vines and trash. Rotation of crops. Spray with Nos. 1, 2, 3, or 4.
	Pea Weevil	Directly after picking, place peas for one hour in stove at 145 deg. F. Close bin and produce an atmosphere of carbon, bi-sulphide fumes.

POTATO	Leaf Blight	Plant sound tubers. Spray with Nos. 1, 2, 3, or 4.
	Scab	Soak seeds for two hours in corrosive sublimate. 2oz. in 20 gallons of water.
	Boring Moth	Nos. 11 or 13. Store under ground if possible. 3oz. in 10 gallons of water.
	Leaf-eating Insects	*See* above.
ROSES	Rust	In winter, Nos. 11 or 13. In spring and summer, Nos. 3 or 4.
	Mildew	Sulphur or No. 15.
	Aphides	*See* above.
	Leaf-eaters	*See* above.
	Bark-nibblers	*See* above.
	Mealy Bugs	Sulphur or No. 15.
STRAWBERRIES ...	Leaf Blight	Destroy affected leaves. In bad cases mow the bed and make a litter; burn leaves over plant. Spray before blossoming, and after fruit is picked, with Nos. 1, 2, 3, or 4.
	Cut Worms	*See* above.
TOMATOES	Blight (*Cladosporium*)	Spray with Nos. 1, 2, 3, and when fruit ripens, No. 4.
	Black Rot (*Macrosporium*)	Small cherry and plum tomatoes free. Stake or trellis vines. Clean seed. Rotation. Burn diseased vines and fruit; spray every fortnight with Nos. 1, 2, 3, and later No. 4.
	Leaf-eating Insects	*See* above.
	Boring Caterpillars	Pick and destroy affected fruit.
VINES	Oïdium	Sulphur, Par-oïdium, or No. 15, when shoots are 12 inches long; again before blossoming, when fruit is set, and every fortnight until the grapes turn.
	Anthracnose	In winter No. 5. In summer sulphur, lime, and powdered green copperas, or hydraulic cement and sulphur, or par-oïdium powder.
	Mouldy Root	Drainage, liming. In bad case pull out and burn vine.
	Cut Worms	*See* under Apple.
	Leaf and Bark-eating Insects	*See* above.
	Chinch Bugs or Rutherglen Flies ...	Spray with Quibbel's liquid disinfectant, ¾oz. in one gallon of water.
	*Phylloxera	Plant in sand: inject No. 17 in winter. Root up and destroy vine until a general plan of working vines on phylloxera-proof stock is adopted.
	Opossums	Strychnine and tea leaves on pieces of board or tin, nailed on posts and removed in the morning; traps; shooting.
	Vermin	Wire netting; blood-smearing, as high up as rabbits can reach, will keep them away. Baits, traps, shooting.
	White Ants	No. 17. Clean cultivation or arsenical compounds.
	Silver Eyes	Reduce mutton fat, spread on piece of tin, sprinkle with strychnine, and tie up branches of favourite trees. Honey and strychnine, shooting, birdlime.
	Grasshoppers	Clean cultivation. Bait No. 16. Sprays No. 10, 11, 12, or 13. Ditching, rolling, ploughing under of eggs. Introduce grasshopper fungus.
	Wireworms	Autumn ploughing, poisoned baits, rotation of crops.
	Cockchafers (White Grubs) ...	Luring beetles by lights over trays into water with skim kerosene. Collecting larvæ when hoeing; liberal use of potash fertilisers. Protect magpies and birds.
	Slugs	Ducks are good scavengers; No. 7, or tobacco powder over plants; quicklime or ashes round beds; traps, consisting of arsenicated cabbage leaves spread over the ground; thin boards covered with films of grease or rancid butter attract many at night; pick and destroy. Powdered kainit mixed with quicklime dusted over the plants when the dark comes and the slugs are feeding, kills a great many.

REMEDIES FOR GARDEN AND ORCHARD CROPS PESTS.

No. 1.—Bordeaux Mixture (Full Strength for Winter Spraying).

Sulphate of Copper (bluestone)	4lbs.
Quicklime (to be freely slaked)	4lbs.
Water	22gals.

(*a*.) Dissolve the bluestone in 10 gallons of water by placing it in a sack suspended in the water and moving the sack about, when the sulphate will quickly dissolve. (*b*.) Make a whitewash with the lime, strain to separate the grit, and bring the milk of lime to 10 gallons. Mix *a* and *b*, and make up to 22 gallons. Use only wooden or earthenware vessels. When the foliage is out, use the half strength mixture by diluting in double the volume of water. To determine if the mixture is safe to use on tender foliage, insert a new nail or the blade of a penknife for at least half a minute; if copper is deposited on the steel, lime must be added.

No. 2.—Bordeaux Mixture (Modified).

The same with 4lb. molasses added.

No. 3.

The same as Nos. 1 or 2, with 44 gallons water. Half strength for tender foliage.

No. 4.—Ammonio-Carbonate of Copper.

Copper Carbonate	1oz.
Ammonia sufficient to dissolve the Copper (*about*	1 pt.)
Water	10gals.

For the last spraying. Does not stain fruit.

No. 5.—Sulphate of Iron Wash.

Sulphate of Iron (*Copperas*)	5lbs.
Sulphuric Acid	½pt.
Warm Water	1gal.

Pour the sulphuric acid over the copperas, and then add the water. No metallic vessel should be used. Apply with a swab after pruning, or better still, just before the buds open. A 10 to 12 per cent. solution of sulphuric acid (six to seven quarts of acid in 25 gallons water) is at times used as a substitute.

No. 6.—Lime, Sulphur, and Salt Wash.

(*A winter spray for deciduous trees only*).

Quicklime	8lbs.
Sulphur	4lbs.
Salt	3lbs.
Water	12 to 80gals.

Boil till the sulphur is quite dissolved, one hour or so, 2lbs. quicklime, freshly slaked, 4lbs. sulphur, ground to a powder if necessary, and five gallons water. It will turn amber colour. Then slake the remaining 6lbs. lime in a cask, and add the salt previously dissolved in water. When dissolved, add to the lime and sulphur, and boil half-an-hour longer. Add enough water to make 12 gallons, stirring all the time. Strain through a cheesecloth sack. Apply lukewarm in winter, and be careful of hands. In Western Australia, where the lime contains a large amount of sand, use 10lbs. quicklime.

No. 7—Tobacco Decoction.

Home Grown Tobacco, Leaf and Stem, or Tobacco Waste	1lb.
Water	6gals.
Soft Soap	1lb.

Steep the tobacco in the soap in water, strain, and use in two applications at three or four days' interval.

No. 8—Quassia Chips and Whale Oil Soap.

Quassia Chips	1lb.
Water	1gal.
Whale Oil Soap	½lb.

Boil the quassia chips and water for half-an-hour; then stir in the whale oil soap. When using dilute with 10 gallons of water.

No. 9.—Sulphur and Lime Paint.

Boil for half an hour—

Sulphur	1lb.
Quicklime	2lbs.
Water	3gals.

and thicken to consistency of paint, with fine clay or with flour, and brush over stems and limbs after pruning.

No. 10.—Kerosene Emulsion.

Kerosene	2gals.
Soap	½lb.

Boil the soap in one gallon of water. When boiling remove to another vessel, add the kerosene and churn violently for 10 minutes, or pour with a fall from one bucket into another until the whole forms a creamy mass which thickens on cooling. Will keep. When used, to one part of the emulsion add eight to ten parts of water, according to season. The time required to effect a complete emulsion will depend on the violence of the churning and the temperature of the mixture.

No. 11.

Same, with 1oz. Paris Green to every 12 to 15 gallons of the emulsion.

No. 12.

No. 1 with 1oz. Paris Green to every 12 gallons of the mixture.

No. 13.

Paris Green	4oz.
Water	50gals.

or 1oz. to 12 gallons. The addition of a little lime will neutralise the caustic property of the arsenic. A little glue or flour will ensure its adhesion to the leaves. To mix well, first make into a thin paste with a little water.

No. 14.—Resin and Soda Wash.

Resin (pounded)	5lbs.
Caustic Soda (70 per cent.)	1lb.
or,	
Washing Soda	3lbs.
Fish Oil	1pt.
Water, to make	25gals.

Boil ingredients, with enough water to cover, for 1 to 2 hours, adding water slowly if there is a tendency to boil over. The compound will assume the colour of black coffee. Ascertain that mixture will assimilate with water by occasionally pouring a small quantity of mixture into water. If not boiled sufficiently will form a ropy mass in bottom of vessel. Dilute with warm water, stirring all the time to one-third, the first bulk (8 gallons making a stock mixture to be diluted to the full amount when used. This mixture can be used twice or three times as strong on deciduous trees when dormant.

No. 15.—Liver of Sulphur.

Potassium Sulphide	½oz. to 1oz.
Warm Water	1 gal.

No. 16.—Bait.

Bran	10lbs.
Paris Green	4oz.
Molasses	4lbs.

Worked with water to the consistency of stiff dough into balls, and laid at the foot of the plants for cut worms and grasshoppers.

Fresh leaves of vegetables, sprinkled with Paris green and water, laid about also make a good bait.

No. 17.—Carbon Bi-sulphide.

Apply with Vermorel's Injector; dose, 10 to 20 grammes to the square yard, or close up to where white ants or phylloxera are.

Bi-sulphide of Carbon	1 part.
Kerosene	1 to 2 parts.

No. 18.—Hydro-cyanic Gas.

For every 100 cubic feet of space to be fumigated—

Potassium Cyanide, 98 per cent.	1½oz.
Sulphuric Acid	2½oz.
Water	3oz.

To generate the gas pour the acid slowly into the water in a deep cup or earthenware vessel, add the cyanide to it, and retire quickly, taking care not to inhale the fumes, which are highly poisonous. Fumigate 45 minutes to one hour. This is the stronger winter treatment for deciduous trees when the leaves are off. For summer treatment and for evergreens use half the quantity of chemicals. Cyanide of Potassium is a deadly poison.

No. 19.—Tar Water.

Boiling Water	2gals.
Coal Tar	1lb.

Add tar, drop by drop, to boiling water, and stir violently. If the tar is added in bulk it will not mix. When dissolved, make up to 100 gallons with water Spray under as well as upper surface of leaves.

No. 20.—Whale Oil Soap.

One pound to two to four gallons water for scale insects; 1lb. to four to six gallons for mealy bugs, aphides, red spider, etc. Good's No. 3 potash soap, one of the best, made of fish oil, and not more than 25 to 28 per cent. water

POULTRY NOTES.

By Frank H. Robertson.

The Colony System.

The colony system of keeping poultry is one which is being largely used in some parts of the world with great success, and might well be copied in this State. The general plan is to use movable houses, best set on wheels to facilitate their transit, and if the front is wired in the fowls can be placed in the new house in the home yard, and drawn by horse-power to a chosen locality. The house need not have a solid wooden floor, inch-mesh wire netting would do, which would also have the advantage of allowing the droppings to fall through on to the ground. The house could be moved its own length every week, and the vacated space dug over, thus fertilising the soil with a very valuable manure. A portable house of this description could be made of iron, which is the best material, but a much cheaper and lighter structure would be one made on a light frame, and covered with hessian, which, if painted with a good lime dressing, to which is mixed some glue, or soap, would last for years. Fowls moved in this manner should not be liberated at once on arriving at their new quarters, but should be confined all the first night, and allowed free egress next morning, by leaving the door open at night time, and if well away from their former haunts they will ever afterwards keep to the new quarters. In the same manner, if open roosting in trees is preferred, if fowls are taken to their new quarters and placed on the branches at night time they will keep to the same locality. The colony system could be worked to great advantage on the fields after the crop has been harvested, the refuse grain would afford feed for a long time, and as young growing fowls are plentiful at that time of the year, this would be an economical mode of fattening them off for the market; the supplying of water would probably be the most troublesome part of the work, and again there may be losses from native cats. If such occurs, the house must be made proof against them with wire netting, and the fowls closed in every night and let out in the morning.

Eggs for Manufacturing Purposes.

That the world's egg market can ever be glutted is exceedingly improbable when one considers that, in addition to the enormous quantities consumed for cooking purposes by the large centres of population, a vast number are used commercially for manufacturing purposes. The calico printing trade of England requires 40 millions of eggs per year, and other trades that require large quantities are leather-dressers, of various descriptions, and wine clarifiers; the latter are estimated to use 10 million dozen annually. It is mostly the cheap foreign eggs that are used for these purposes.

THE STATE FARM, NARROGIN.

Eggs may now be ordered from the stud poultry on the State Farm from the following birds:--White Leghorns, Brown Leghorns, Minorcas, Golden Wyandottes, Plymouth Rocks, Black Orpingtons. Indian game: Crossbred for table--Pekin Ducks and Indian Runner Ducks. Price, 12s. 6d. per dozen, carriage paid, to any address in the State. All orders should be accompanied by remittance for the number of settings required, addressed to the Director, Agricultural Department, St. George's Terrace, Perth.

AMALGAMATING BROODS.

It is a good plan to put down two settings of eggs at the same time under separate hens, and when the chickens are out both lots can be given to one hen, thus saving a lot of trouble in having to look after two lots of chicks. It is not likely that the one bird will have too many chickens to look after, as it is rare for both lots to be quite successful, owing to the many mishaps that occur, as every breeder knows. What with egg-eating, unfertile or smashed eggs, etc., the numbers get considerably reduced, and if the one hen rears 14 chicks, that is seven from each setting, it is quite satisfactory. But in putting two lots of chicks together, whether out of the incubator or from hens, let them both be of the same age; even seven days difference will not do, as the younger birds do not get their fair share of food, and generally die off one at a time. In shifting young chickens, let them be placed under their new mother at night time; if given to her in the day time, the hen picks at and drives off the strange chicks, and will not foster them.

POULTRY MANURE.

The value of poultry manure is not appreciated to the extent it deserves by farmers and others, and when used but little care is exercised in handling this valuable fertiliser so as to obtain the greatest amount of good out of it; the general custom is to throw it outside the fowl houses, and when, in the course of a year or so, some manure is required the fowl heap is carted away and used along with other yard manures that are about. Fowl droppings which have thus been treated have, owing to exposure to wind and rain, lost a great part of their valuable properties; the proper course is to pack the droppings when freshly gathered into barrels or boxes protected from the rain. The following experiments were conducted by the Ontario Agricultural College of Canada in 1902 to test the comparative values of ordinary farmyard manure and poultry manure for the production of potatoes; the experiments were conducted in duplicate. The following average yield of potatoes per acre were obtained:—Unmanured, 105 bushels; five tons of barnyard manure per acre, 144 bushels; one ton of poultry manure per acre, 125 bushels; two tons of poultry manure per acre, 158 bushels.

THE POULTRY OUTLOOK.

The poultry outlook at the present time is, I consider, a most favourable one for Western Australian farmers, and one that should be taken advantage of by all land owners, whether grain, fruit-growers, or general agriculturists, especially those who give their occupations that thoughtful attention which finds its reward in the realisation of the greatest amount of profit that their holdings will yield under careful, systematic, and, above all, common-sense methods of husbandry. Whatever branch of farming a man is engaged in, none can gainsay the fact that a considerable amount of thought and knowledge, thus entailing extra work, is incurred if the very best results are to be obtained from the wheat or chaff yield, the crop of fruit or grapes gathered, or the successful rearing of the horses, cattle, or pigs; but somehow or other an idea is far too prevalent that the work, care, and trouble necessary for the above, by some unfathomable process of reasoning, do not apply to the production of poultry; not that the raising of chickens and eggs require a profound and deep study, far from it; the fact I wish to emphasise is that they do require *some attention,* and should not be left entirely to their own sweet will to die or lay eggs just as their haphazard surroundings will admit, and if such is done there is no branch of the farm's live stock that yield so good a profit for the outlay of capital and labour involved. The last 12 months (N.S.W.) laying competition shows that the average profit on each hen was 9s. 6d. The total cost of staple foods for the year was pollard, bran, and grain, £59 13s. 4d.; meat £7 16s.; grit 17s. 6d.; total £68 6s. 10d. The market value of eggs laid was £176 9s. 6d., thus showing a profit of £108 2s. 8d. The average value of the eggs was 15s. 6d. per hen. There were 38 pens, each of six hens—228 hens in all. Now supposing these 228 hens were running on a farm in Western Australia, where they had unlimited run and access to stubble fields, and other refuse grains, also provided they were properly looked after, the profits would be very much larger. The average yield for each hen at the laying competition, viz., 129 eggs for the twelve months, is by no means great, and with careful selection and judicious feeding could be greatly increased on the average farm yard. The magnificent prices obtained here for local fresh-laid eggs places the industry on a far more profitable footing than the above, and, according to last year's wholesale market prices, a year's yield of 129 eggs per hen would return 20s. gross per hen, calculated at 1s. 10d. a dozen, that being the average price that eggs fetched in the Perth wholesale market during the past twelve months. The cost of feed per hen was 6s. at the competition, and to the West Australian farmer, who grows the most of his own feed, it would not exceed that amount (probably be much less), thus showing a profit of 14s. per hen, which the most sceptical must admit is a very fine one. The breeder close to the city can obtain a higher average price for his eggs by selling to private customers, but then he is not so advantageously placed as regards the cost of feed. And now, coming to my initial point, viz., the poultry outlook; the present appears to be very favourable for several reasons, the chief one being the likelihood of cheap food, as the prospects of a bountiful harvest all over Australia point to cheaper grain and fodder of all kinds; another reason is that, owing to the high price of wheat, etc., many poultry-keepers sold off their poultry, consequently stocks are low, and unless an unusually large number of persons suddenly turn their attention to egg production, the prices of eggs are likely to be as dear after the coming Christmas as they have been this year. In conclusion, therefore, I would strongly advise all land owners to now take advantage of the favourable outlook and hatch out a good supply of chickens this season; the earlier the better, as July and August hatched chickens thrive twice as well as the November and December birds, and are consequently twice as profitable.

PRODUCERS' CONFERENCE, 1903.

RESOLUTIONS DEALT WITH.

The following list of resolutions that were passed at the Producers' Conference, held in March last, have been dealt with, and are given here, with the results appended to them:—

UNIMPROVED LAND TAX.

Moved by Mr. W. J. Bryant (Coogee Agricultural and Horticultural Society):—"That this Conference is strongly in favour of a tax upon the unimproved values of land."

The Hon. the Minister of Lands, to whom the matter was referred, replied to the effect that this suggestion may be adopted by local bodies under the new Roads Act.

APPLICATIONS FOR LAND.

Moved by Mr. Nenke (Wagin-Arthur Districts Agricultural and Horticultural Society):—"That, in the opinion of this Conference, the Minister for Lands be requested to treat all applications for Government lands in priority from the time they are handed in and accepted by any authorised land agent, and not, as at present, making the time they reach the head office the date and time of application."

The Hon. the Minister of Lands, to whom this matter was referred, replied that he is unable to deal with the matter at present, but that he will give it his careful consideration at a later date.

RESERVING LAND FOR WATER RESERVES.

Moved by Mr. T. Williams (Goomalling):—"That, in the opinion of this Conference, it is desirable to instruct all surveyors in the Eastern districts to reserve all suitable places on Crown land, for conserving water by well and dam, that are within a reasonable distance of each other, so as to benefit present settlers and encourage further settlement."

The Surveyor General, to whom the matter was referred, replied as follows:—

"The Regulations under which surveyors work provide that they should recommend for reservation any localities that they think should, in the interests of the State, be retained for the conservation of water and other purposes, and I hardly think it necessary to give further instructions on the matter at present.

"In my opinion, it would be most inadvisable to fix the minimum area for a water reserve at 500 acres, as suggested, as there are many localities where a much smaller area would be sufficient for all requirements.

"I am inclined to think that the Conference had in view some of the dryer districts, such as the country east of Goomalling, where reserves for water have already been suggested, when the classification of the country was being carried out, and bores are now being put down by the Public Works Department.

"Where potable water has been obtained in the bores mentioned, further reserves will be immediately recommended."

With these remarks the Minister agrees, and the above course will be adhered to.

BONUS ON EAGLEHAWKS.

Moved by Mr. Hammersley (Toodyay Agricultural Society):—"That, in the opinion of this Conference, a bonus of 2s. 6d. should be placed on eaglehawks."

The Under Treasurer, to whom the matter was referred, replies that provision is to be made on the next Estimates for a bonus of 1s. per head on eaglehawks.

PERISHABLE GOODS.

Moved by Mr. J. H. Stone (West Swan):—"That this Conference views with alarm the action of the Railway Department in allowing trucks loaded with perishables for the fields to be delayed at Perth and other stations, thereby causing great losses to producers."

The Commissioner of Railways, to whom the matter was referred, replies to the effect that his Department is "doing the best possible under the circumstances."

FENCING WIRE.

Moved by Mr. Fawcett (Murray) (Wonnerup Progress Association):—"That, in the opinion of this Conference, fencing wire should be carried by the Railway Department at the same rate as fertilisers."

On referring the matter to the Railway Department, the Commissioner reports as follows:—"I consider the existing rates on G.C. iron and fencing wire are already sufficiently reasonable, but when considering the revision of the Rate book, this item will be borne in mind."

DEHORNING CATTLE.

Moved by Mr. Eastcott (Wagerup Agricultural Society):—"That the Government be urged to amend the law, so as to admit of the legalising the dehorning of cattle."

The Hon. the Attorney General, to whom the matter was referred, replies that action will be taken in framing the Police Offences Bill, to give effect to the resolution.

SECOND-HAND FRUIT CASES.

Moved by Mr. J. S. Park (South-West, Central):—"That, in the opinion of this Conference, the use of second-hand fruit cases be absolutely prohibited."

The Hon. the Minister for Lands has approved of an amendment being made to the Insect Pests Act that will embody the wishes of the Conference.

THE TICK PEST.

Mr. A. R. Richardson moved:—(*a.*) "That, in view of the great scarcity and high prices ruling in this State for butchers' meat, and the very limited supply and high prices obtaining for store cattle, it is extremely important that all unnecessary restrictions curtailing the supply of store stock available to graziers and agriculturists, and of fattening cattle for the metropolitan and goldfields markets, should be at once removed; and (*b.*) this Conference is, therefore, of opinion (provided the Chief Inspector of Stock is satisfied that after two or more dippings any tick-infested East Kimberley cattle landed at Fremantle are free from tick, and, therefore, clean, and that no serious risks to clean herds would ensue from their distribution in the State south of the 29th parallel of latitude) that the Governor-in-Council should at once authorise such amendments of the present tick cattle regulations as will permit East Kimberley cattle being so distributed."

The Chief Stock Inspector, to whom the matter was referred, reports that he had already expressed his confidence in the efficacy of two dippings, and has recommended the Government to release the tick-infested stock so treated.

PLANT DISEASES.

By Richard Helms.

(Late Entomologist to the Department of Agriculture of W.A.)

Potato Scab.

Recently the Health Department submitted very badly affected "scabby" potatoes to me, for the purpose of ascertaining whether tubers diseased in this manner were unfit for human consumption. It is the first time, that I know of, this question has been raised, and I gave my opinion to the effect that nothing deleterious to human health was produced in the flesh of the tubers by this disease.

It is generally considered that with lightly affected tubers their culinary quality is not deteriorated, but when they are badly covered with scurfy patches it is more than likely that their nutritive value has been impared. There is no doubt that severe attacks stunt the growth of the tuber, and in consequence the development of starch within them is checked to some extent, but the qualitative loss is evidently the lesser and difficult to estimate, as the nutritive value always varies considerably, even in the healthiest tubers.

It is the quantitative loss which concerns the purchaser, and becomes apparent by the thicker peel that has to be removed from diseased tubers in the paring. This fact and the unsightliness makes such potatoes almost unmarketable, or considerably reduces their selling value, which means loss to the producer. Moreover, if kept in bags or heaped up in large masses, scabby potatoes will sooner and more strongly acquire a musty flavour than those with a clean skin, because the odor produced by fungus growth will more rapidly permeate them, owing to the broken skin on the one hand, and the spongy nature of the scurf, which is conducive to the growth of moulds, on the other.

The cause of the disease has long been a disputed question, which is not definitely settled at present. Certain investigations, however, indicate it to be more than probable that it is entirely due to a specific fungus which is not yet properly studied in all the phases of its development to be correctly understood.

For a long time the predominating belief was that certain soils contained ingredients which acted like a mordant upon the skin, and the scab to be caused merely by the healing process. The rare occurrence of scab in sandy soil lent colour to this hypothesis. Another healing theory prevailed regarding insect attacks, which seemed very feasible, although many insects and worms, which are colloquially classed with them, were accused merely from the fact of their being found in the neighbourhood of diseased tubers. Millipedes, *Julidæ*—undoubtedly vegetarians and sometimes great garden pests, have also been blamed as being the cause of scab, because they have frequently been observed to feed at or near the scabby spots, which evidently make convenient points of aggression, but as they never appear in large numbers, in fact only here and there in a potato field, they must be considered innocent of the mischief. Another popular opinion, which I shared for a considerable time, accuses the commonly called "spring tails"—a low form of insect life, obtaining its popular name from the saltatorial movements of its members, scientifically known as *collembola*—as causing the scab, because great numbers of them often occur where the disease is found. However, the weak mandibles of these insects are scarcely powerful enough to penetrate the skin of the potato, and as they are known to be eaters of decaying substances, their presence is more likely to be due to such matter, and probably to stable manure in some cases.

Whether the beginning of the disease is attributable to wounds produced by insect bites or punctures, by which a more susceptible field of aggression is produced, may remain a speculation, as the real trouble is seemingly a microscopic fungus. I quote Dr. R. Thaxter on this point: "There is no longer room to doubt that the cause of the disease is a bacterioid fungus, and that, whenever the disease has been examined out of doors, it has invariably been found to be visibly accompanied by the growth of an undetermined fungus, at least in its earlier stages; and that this fungus, when cultivated in an absolutely pure condition on nutrient substances, and thence transferred to growing potato tubers, with the necessary precautions, produces in them the disease called scab, from which it was originally obtained, the observations and experiments so far being convincing to the author that the two are directly associated as cause and effect." *

REMEDIES.

The remedies for the disease must be preventive. On no account plant scabby potatoes, as this will bring young tubers in almost direct contact with the spores of the fungus. Do not again plant potatoes on land which produced a scabby crop, but alter the cultivation on infested soil. Work your land well, and thereby eliminate the fungus, and by exposing its spores to light and air, render them innocuous. Potatoes suspected of becoming scabby should be dug immediately they are mature, because the scab spots deepen as long as the tubers remain in the ground.

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* Dr. Thaxter has named the fungus *Oöspora scabies.*

Scabby potatoes or scabby peel should be thoroughly boiled before being fed to stock, in order to prevent the fungus being disseminated with the manure. This is of great importance, and on no account should be neglected, because all authorities agree that through barnyard manure the disease has been increased where pigs and cattle had eaten scabby potatoes or their peel raw. Dr. Thaxter says he is convinced "that the feeding of scabby tubers raw to stock is one of the most important means by which the disease is spread on farms." Little doubt exists that scab spores pass uninjured through the digestive tract of stock, and develop on the evacuations. By cooking the scabby material, the spores are killed and the contamination of the manure prevented.

It is further necessary to observe that the clean-skinned potatoes picked from samples partly infested with scab are not safe to plant, as spores are certainly adhering to them. If it is absolutely necessary to use such seed-tubers, then these should be washed clean in water and later soaked for an hour to an hour and a half in a copperas solution of one ounce copperas to a gallon of water.

Concisely recapitulating the foregoing, we have the following rules for preventing the spread of potato scab:—

(1.) Always plant perfectly clean-skinned potatoes.
(2.) Change the crop at once if potatoes are found to get scabby in the land.
(3.) Till your land well, and aerate it freely if it is infested with the fungus and spores.
(4.) Do not let your potatoes remain longer in the ground than is needed if they are known to become scabby.
(5.) On no account feed scabby potatoes or their peel in a raw state, but always cook the diseased material well in order to destroy the spores.
(6.) Disinfect your seed-tubers if the least suspicion exists that they are contaminated with spores of the scab fungus.

The scab of beets is caused by the same fungus. Potatoes should, therefore, not be planted in soil that has produced scabby beets, and beets must not follow upon scabby potatoes.

Some authors ascribe the scab disease to bacteria, but this is merely a question of exact science; the preventive measures remain the same.

RAMIE FIBRE.

The following letter has been received by the Director of Agriculture from Mr. D. Edwards Radclyffe, of 25 Birchington Road, West Hampstead, N.W. London:—

"Could you not draw the attention of your readers to the possibilities of 'Ramie,' or 'Rhea'? Our Empire is vast, and there are millions of acres awaiting cultivation, but in these days of competition, the difficulty is to find a paying crop. Now 'Ramie,' or 'Rhea,' 'Urtica,' or 'Boehmeria,' grows in almost any zone; of course, with different results, as it produces from one to four crops per annum, according to locality. It would be a paying crop on waste land, useful for no other purpose. The cultivation is easy, and when once planted, it will thrive for about 18 years, requiring but little attention, beyond hoeing, mulching, etc.

"The demand for this fibre (which is the strongest and longest of all fibres), is increasing by leaps and bounds. Hitherto the Chinese alone have been alive to its merits, and they have cultivated it largely for home consumption, but little finds its way out of the country, and then only at prohibitive prices. At present it fetches as much as £35, and even £40 has been paid this spring. When once a plantation is firmly established, it could be cropped for £3 10s. per ton, I am informed, in a country where three or four crops can be obtained yearly. Think of the vast possibilities of profit this opens up. The one great drawback, hitherto, has been the irregular supplies. It makes the most beautiful and durable fabrics. For sail-cloths, fishing lines, nets, ropes, etc., is invaluable. Its uses are legion, but as the supply is depending on one country, it is comparatively unknown. If our planters would put their hands to the plough, and cultivate 'Ramie,' a vast industry, as great as cotton, would spring into existence. The first planters will make fortunes, and large profits will prevail for years, as it will take several decades to cope with the demand, and even then a steady trade is to be relied on. America is quite alive to the possibilities, and the U.S.A. Chamber of Agriculture is encouraging its growth. Why do our Colonial Governments not foster it? India, Assam, Straits Settlements, Australia, Queensland, Tasmania, New Zealand, Borneo, West Indies, Guiana, Natal, South, East, and West Africa could all grow 'Ramie' profitably. Another great advantage, it can be so easily manipulated, that all these, and other Colonies, could establish industries to work up the splendid fibre on the spot, so not only would the farmer benefit, but he could find a market at home, and not depend alone on English markets. There is no reason why manufacturers could not, and should not start in almost every Colony of the Empire.

"With this vista of a profitable industry in view, our Colonial Governments, Chambers of Agriculture and Commerce, planters, farmers, and manufacturers would do well to inquire further into the possibilities of Ramie, Rhea, or China grass.

"Anyone desirous of knowing more as to cultivation, seed, and manufacture, have but to send me a few stamps of the Colony, as compensation for postage, and I will send them particulars and information how to procure seed and machinery, etc., as I am desirous of encouraging the trade in what I designate the textile of the future, in every possible way.

"The demand at the moment for dress goods (Bradford), incandescent gas mantels, saddlery, boot threads, and similar goods is enormous, and far beyond the limited supplies. The 'Shamrock,' 'Bona,' 'Dragon,' and many of the leading yachts have sails of Ramie.

"I trust you will draw the attention of your readers to the above, and that it may be the means of starting a profitable industry in many of our Colonies."

With reference to the foregoing letter, it may be as well to reproduce an article appearing in this Department's *Journal* in January of 1898, advocating the cultivation of this fibre. So far as is known, however, but little or no effort has been made to crop it in this State. Elsewhere hundreds of acres of Ramie are being cultivated, the growers already reaping rich harvests for their efforts. It is to be hoped that our settlers will not allow the opportunity to go by without some attempt to profit by what is evidently a paying industry. The article referred to is as follows:—

"The Hon. the Premier has forwarded to the department a pamphlet compiled by the Rhea Fibre Treatment Co., London, which deals exhaustively with the cultivation and the manufacture of the fibre into articles of commerce. Specimens of fabrics manufactured from the prepared rhea accompanied the pamphlet, and are now arranged in the museum of the department for the inspection of those interested. During the past 30 years, we are told, scientists and machinists have been experimenting with the fibre in order to find a way by which to render it suitable to the purposes of the manufacturer. In 1869 the Indian Government offered a reward of £5,000 for a machine or process which would treat the plant at a cost low enough for the requirements of the textile industries, and again in 1877 they made another attempt in the same direction by offering 50,000 rupees. After many trials, the money offers were withdrawn, the experiments proving that the inventors had not found the process needed. During the period mentioned, the importance of the fibre having become recognised by the textile industries on the Continent of Europe, and especially in England, the scientists of the West were working with the fibre, and by treating it with various chemicals, had succeeded in separating the fibre from the bark, and manufacturing cloths, which, however, was not calculated to benefit the industry, as after about six months the manufactured article was found to fall to pieces, the chemical dressing having had the effect of making the fibre brittle and useless. To Gomess, an English chemist, who spent several years in India, the discovery of the proper treatment of rhea is attributed. By his process the use of zincate of soda is found to eliminate the resins and to effect the desired result without in any way doing the slightest injury to the fibre. The combined lightness and toughness of the fibre renders it most suitable for tents and sailcloths. It is said that three-fifths more cloth of equal strength can be made from rhea than from the same weight of linen, as 1,000 yards of rhea canvas weighs only as much as 600 yards of linen, its durability and resisting strain being at the same time greater.

"Amongst some of the uses to which it can be applied is mentioned all fine and fancy goods, dress fabrics, plushes, laces, drills, muslins, sheeting, table linens, etc.; and for heavier work, fire hose, belting, twine, hawsers, insulating purposes—in short, for all purposes for which flax, cotton, and hemp are used. The plant is extremely hardy, and will thrive in almost any soil, particularly above inundation level. The sub-soil should be good, as the roots penetrate to a depth of 12 or 14 inches in search of nutrition if the surface soil is poor. There should be a proper system of drainage, and if the land is poor, manure is required. With regard to its cultivation, the following notes are printed from the pamphlet referred to above:—

"There are doubtless many forms of both 'nivea' and 'tenacissima,' and the intending planter, or preferably the Governments in the first instance, would do well to procure from India, China (North and South), the Malay Islands, Java, Borneo, Jahore, South Africa, and Mexico the different varieties of the plant to experiment with, in order to discover which of them yields the maximum of superior fibre under the conditions of the soil and climate peculiar to the localities where cultivation is intended. It is obviously a matter of great importance, upon the full appreciation of which depends the future profitable cultivation of rhea, that the question as to the variety best suited to the region where cultivation is to be attempted, should be settled. A small crop, or poor fibre from the first and second cuttings, should not be allowed to dishearten the grower, because, in subsequent cuttings, an increased yield and better quality will be obtained; it may, therefore, be advisable to loosen the soil round the roots, apply manure, and to water well after each cutting has been taken, so as to get another crop quickly.

"CLIMATE.—The *Boehmeria nivea*, having the under surface of the leaf silvery white, is said to grow best in a temperate climate, such as that of the northern parts of China.

"The *B. tenacissima* (or utilis), having the leaves green on both sides, with whitish veins, and the *Bâan-rhea*, are tropical plants, requiring a warm, equable, climate, moist atmosphere, and fairly good rainfall.

"Soil.—It is said that the *rhea* plant is exceedingly hardy, and thrives in almost any description of soil. In China, the Malay Islands, in such parts of India as Assam, Rungpur and Dinagepur, in Burmah, in Tonkin, in Egypt, and in other countries mentioned, one form or another of the *Urtica* family has been cultivated for years, and the fibre utilised by the natives. But preference should be given to land above inundation level, having a rich, light, not too sandy loam, somewhat shady at first. (In the gaol at Nowgong, Assam, rhea plants put down in the sun did well, and yielded five crops or cuttings in twelve months.) The subsoil should be good, as the roots penetrate 12 to 14 inches deep in search of nutrition if the surface soil be poor. The drainage should be good. If the land be poor manure is requisite. Rhea will grow in strong alkali soils, provided the alkali is not carbonate of soda; because if the ground is shaded, and the evaporation going on through the leaves of the plant instead of at the surface of the soil, will not accumulate the noxious salts around the root crowns so as to corrode them.

"Fertilisers.—When cutting a crop it is of importance to strip the leaves from each stem and leave them on the field, to be hoed into the soil, as they contain a large proportion of the requisite plant food. The woody substance of the stems, after the ribbons have been stripped off, may be used for fuel, and the ashes returned to the soil. Also, where a factory is established for degumming the ribbons by the Gomess process, near where the plant is grown, the effluent from such factories, instead of being wasted, might be collected in pits and transferred to the fields; it contains valuable fertile products eminently suited to the rhea plant. An analysis of rhea shows that the most favourable manure should contain nitrate of soda, sea salt, and lime. Ordinary farm manure (cow-dung, ashes, and rubbish) seem to answer well.

"Cultivation by Seed.—This course must be adopted when the germ of the plant has to be carried over greater distances, occupying a long time in transit. The method of sowing adopted in the Kangra Valley, in Northern India, was on a gentle hot-bed, under glass, in March and April. The seed was scattered over the surface, covered very thinly with sifted earth (covering with earth is not recommended) and carefully shaded from the sun until the plants were about three inches high, when sunlight was gradually admitted. When sufficiently strong they were planted out a foot apart every way. The seed may also be sown in well-prepared seed beds about three feet wide. As the seed is very small, it will be found best to mix it with sand or finely powdered soil, and scatter it on the seed-bed, which has been watered over night. After sowing, the beds may be gently pressed. The beds should be covered with coarse matting on supports about two or three feet high, or with brushwood or straw, to keep the ground moist and to prevent the scorching of the young seedlings by the sun. The matting or brushwood and straw should be sprinkled with water, and when the plants appear the covering should be removed at night. Liquid manure is beneficial to the young as well as to the full-grown plant.

After taking off a crop the plants should be manured with farm manure of not less than one year old. Fresh cow or horse droppings are to be avoided. Before sowing the seeds, they should be tested in water, all those that float being rejected.

"CULTIVATION BY CUTTING OF THE STEMS.—The stems should be spring-grown ones, allowed to ripen well, and not cut until duly ripe. Then divide the ripened portion of the stem where the cuticle has turned fully brown into short lengths, each including three eyes or buds. Cut a quarter of an inch below the bottom bud and as much above the top one, and plant with the centre bud level with the surface. If the weather be damp and cloudy the cuttings will readily strike root, otherwise they will require shading for a week or ten days, the soil being kept moist. As with seedlings, they should be put into the ground about a foot apart.

"CULTIVATION BY DIVISION OF ROOTS.—This is by far the most advantageous and profitable method, and roots may be carried fairly long distances, as orchids are carried. The plants for this purpose should be three or four years old. After gathering the spring crop dig up each plant and carefully remove the earth from the roots; it is as well to put the mass of roots into running water for a short time; this cleanses them thoroughly. The tuberous parts of the roots will be found to show a large number of eyes similar to those on a potato. From these carefully separate portions each containing five or six eyes; let the cuts be clean, and reject all fibrous and decayed matter. Expose these sets to the sun for a couple of hours to dry the surface of the wounds, and then plant six inches deep, and at the distance of one, two, or four feet apart every way. As in some localities the plant grows more luxuriantly than in others, the distances between the plants, to give the best yield, will suggest itself after a little experience. If, in consequence of overcrowding, or poorness of the soil, the plants appear stunted and weak, then, after having reaped the available shoots of the first crop after spring, transfer every other plant to fresh ground, and manure and hoe the old land. It will be found that the shoots from root planting will grow rapidly to a height of four to six feet, and that the roots will become stronger every year, the plant being perennial. The first crop may be ready in two or three months from the time of planting out the roots, especially in favourable situations.

"The plants require to be placed on raised ridges, for, though requiring and using a considerable amount of water, they are liable, especially those of the temperate climate variety, to be injured if water is allowed to lodge at the roots; thorough drainage is therefore essential."

GREEN CROP MANURING.

The principle of green manuring is based upon considerations which I particularly called attention to in "Seasonable Notes" during winter. The question was then discussed as to whether it is necessary to consume green crops by live stock, and whether they might not be at once ploughed under without consumption. It was shown that animals must remove a considerable amount of the fertilising ingredients from the food they consume, and that the total manurial effect of such crops must be diminished by feeding them. The cost of harvesting or storing, converting into manure, and carting back the dung, must all stand against profit, and if, as often happens, the stock are sold at little or no increase in value, the question arises as to the economical soundness of the system. The argument does not affect live stock of high value, but appears much to the point in the case of ordinary grazing stock bought in when dear, and likely to be brought out when values have receded. It affects the consumption of hay, straw, fodder crops, and roots, and raises the question whether these materials might not as well be ploughed in without the trouble and expense of feeding them. If hay is to be made and *consumed on the premises* at small profit or even at a possible loss, might it not be better to roll down the clover, and plough it in, thereby saving all the cost and risk of haymaking, buying stock, and carting back manure to the land?

If the hay is intended for sale, the question is entirely different; but if for home consumption, the ordinary practice becomes rather a speculation of a risky nature. It is evident, that so far as the manurial value of clover hay is concerned, it would be absolutely realised by ploughing in the green crop. There is no manurial advantage in consuming it, but the reverse, as it suffers first from what the animals abstract from it, and secondly from waste in converting it into manure. The *dictum* that stock keep up the fertility of the land breaks down completely, unless it is by the consumption of cake and corn, which is outside the question under discussion. There is, in fact, no reason why purchases of phosphates, potash salts, and nitrates should not be as effective as purchases of corn and cake, and hence the necessity of live stock as a means of keeping up the fertility of land breaks down.

Such are the main arguments in favour of green crop manuring. They will commend themselves to those who have found that buying-in stock for winter-grazing or summer-soiling has often proved disappointing. On the other hand they will be scouted by breeders of high-class stock and successful graziers. The value of the argument lies in the fact that it raises a definite point. If cattle or sheep are maintained for months without a substantial profit, it appears to be a fallacy to imagine that they have paid through their manure. It is not necessary to labour the question further, as the more the matter is thought out the more self-evident will the proposition become. I should not go as far as Dr. Harlan, who is an uncompromising advocate for ploughing in fodder and root crops in preference to feeding them with stock. He considers it the best method of enriching land, and incomparably the cheaper, as it involves much less capital. He is an American writing for Americans, but much of what he advances is well worth our attention. Dr. Harlan tells us that one ton of farmyard manure contains 10lbs. of nitrogen, 5lbs. of phosphoric acid, 12½lbs. of potash, and 1,500lbs. of water. One ton of green clover contains 12lbs. of nitrogen, 2½bs. of phosphoric acid, 9lbs. of potash, and 1,600lbs. of water. His argument is that clover ploughed in is a much cheaper preparation for wheat than if it had been mown, made into hay, converted into dung, and then carted back to the land. Certainly it would be so if the hay crop should be damaged with rain, and the speculation of feeding it to stock should not turn out well. As already said, if the clover hay was sold the question would be entirely different. The subject is a large one, and occupies 269 pages of very readable matter.

Turning to turnips, I find remarks which bear upon the discussion as to the wisdom of ploughing them in under certain conditions. "One ton of turnips contains 4lbs. of nitrogen, 1½lb. of phosphoric acid, 6½lbs. of potash, and 1,818lbs. of water. One ton of turnips leaves 7lbs. of nitrogen. Twenty tons per acre are considered a good crop. The tops weigh about eight tons. The two together furnish 136lbs. of nitrogen." Quoting from Alderman Mechi's writings he adds, "It seems very ungracious that when you have grown a splendid crop of turnips, the sheep are to consume it, leaving you nothing but the price of the hay and cake you gave them with it." Certainly, when such a poor result is obtained, there seems to be no object in carrying out the system. Another case of a money-getting farmer is quoted from the same good old authority, who, however, often found himself in conflict with the agriculturist of his time. It is that of a very successful man who never kept any live stock except a couple of cows, and who never bought any feeding stuffs or manures. "He keeps his land clean and fertile by ploughing in green manures, which require no hoeing or labour, and only one ploughing." Referring to green rye, Dr. Harlan says, "One ton of green rye contains 11lbs. of nitrogen, 4½lbs. of phosphoric acid, 12½lbs. of potash, and 1,400lbs. of water. I have seen 15 tons per acre growing on the 8th of May, and this was ascertained by careful measurement. Then, on a field of 20 acres you would have 300 tons of manure at very little expense, all evenly spread on the ground and ready to plough in. The most careful analysis is worth nothing if green rye is not equal ton for ton to stable manure, with one small exception; the latter has ½lb. of phosphoric acid per ton more than the former. Now, what will it cost you to cover a field of 20 acres with 300 tons of manure? Can you buy it, haul it, and spread it, for less than 450 dollars? The rye will cost you for the seed one dollar per bushel, and two bushels per acre will be 40 dollars over 20 acres. That is, it will cost more than twelve times as much to improve with barn-yard manure, at 1½ dollar per ton than to use green rye. Besides this great merit, it protects the field from wasting during winter." Dr. Harlan discusses the merits of white mustard, Indian corn, clover, millet, Hungarian grass, and other plants as manuring crops. The points constantly kept before readers are the perfect economy of the system; the relief from expense, trouble, and anxiety; and the position that there is no gain, but, on the contrary, a heavy loss, in fertilising ingredients, in converting green crops into farmyard manure. Such an advocate for an undoubtedly good system is liable to run to extremes, but there can be no doubt that much may be done by ploughing in green crops. They shade the land, and may be made the means of destroying millions of weeds by ploughing them in with the green crop. The turnip is not well suited for this system, as it is unwieldy and difficult to bury. It is also slow in decaying. Forage crops may, however, be grown with the object of ploughing in, and if the opportunity occurs of feeding them, or some of them, with stock, the case is not in the least degree weakened.

JOHN WRIGHTSON.

FLAX-GROWING IN VICTORIA.

A PROFITABLE INDUSTRY.

A volume might be written on the unsuccessful attempts which have been made during the last 20 years to establish the flax-growing industry in Victoria. It has been boomed, and bonused, and experimented with, only to prove time and again that on old world lines of practice, which involve costly and laborious methods, it was unsuited to our conditions of agriculture, and had to give place to more remunerative crops. Flax-growing, which is an important crop in many of the Continental countries of Europe; in India, where labour is cheap; and, singularly enough, in Argentina, where it is grown almost exclusively for the seed to the extent of nearly a million acres, appeared to hold out no immediate hope of promise to the Victorian farmer.

MESSRS. WOLLF BROS.

But it has been reserved for three young German settlers, Messrs. Wollf Bros., of Traralgon, after devoting several years to the exclusive cultivation of flax, both for seed and fibre, in which patient experimental work, close observation, and clever resourcefulness have been displayed, to put in operation new processes, which supersede the old world methods in simplicity and economy, and are equally effective. It has always been held and practised, and adopted in the early experiments here, that a crop of good fibre and seed could not be obtained from the same field. That in order to get good fibre the crop had to be harvested when in blossom, before the seed had ripened, and that above all it had to be hand-pulled—a very costly and laborious process. Messrs. Wollf have proved that both seed and fibre can be obtained from the same crop, after the seed has thoroughly ripened, and that so unnecessary is hand-pulling that fibre which will command the top price when submitted to expert European buyers is produced when they turn into their flax fields with the reaper and binder, and cut it down at the rate of 10 to 12 acres a day. For the old process of pit-retting (that is, steeping the straw for several weeks in pits of water) they have substituted the much more simple one of spreading it out on the grass in the autumn to let the dew and rain do the work; and, instead of rippling out the seed, they have mounted two wooden rollers, one above the other, and between these two, men can feed in the sheaf heads without untying the binder knot, and thrash out the seed perfectly at the rate of over two acres a day.

Returns per Acre.

Messrs. Wollf had 120 acres under flax last year. Their gross returns from this area in seed and fibre will amount to £2,000, or at the rate of £16 16s. per acre, and after paying away in rent, cost of cultivation, and all the processes of harvesting, threshing, and fibre manufacture, over £8 per acre, they will net the handsome profit of £8 or £8 10s. per acre. They are extending their operations this year. While one brother, Mr. G. Wollf, remains in charge of the work at Traralgon, another is superintending 300 acres of flax which they have nearly completed sowing at Maffra, where they have leased land for the purpose; and the third has gone to Europe for the purpose of finding out if new machinery and appliances can still further be adapted to their work.

A visit to Messrs. Wollf Bros.' farm, about six miles out of Traralgon, where the work of converting flax straw into fibre is still going on, is full of interest, and, after obtaining from Mr. G. Wollf the story of their persistent effort in overcoming the many difficulties they have met with, and their ultimate triumph in placing the industry on a sound paying basis, there remains a hope that flax-growing may become an important factor in our rural production.

Progress and Prices.

"We began flax-growing," said Mr. Wollf, "six or seven years ago on our own selection at Callignu, but the results were not very encouraging at the beginning. We followed the old methods of hand-pulling and pit-retting, and the labour and cost of these operations left little profit. Experiments we carried out convinced us that we could let the seed ripen, and still have good fibre, and that the latter would command top market price when cut, instead of hand-pulled, and when dew-retted, instead of pit-retted. In proof of that, I may say that we sent samples of the flax treated in this way to some of the largest flax buyers in Europe, and last year we received an offer from a Belgium firm of £45 per ton for 10 tons delivered in Melbourne. But we have had no trouble in selling all we can produce to Messrs. Miller & Co. at fair prices. Three years ago we received £40 per ton; last year £45, and this year £42, and at these prices, with the methods we have adopted, flax growing will pay well. Three years ago we moved down here, and paid a rental of £1 per acre, and extended our operations. This year we had 120 acres under flax. Our average return of seed was 14 bushels per acre, which we have sold readily at £14 per ton for linseed-oil making, which works out at 7s. 6d. per bushel, and when we finish the flax it will average five and a half hundredweight to the acre, which is £11 11s. per acre; so that our gross returns will run into £16 16s. per acre. We intend to stick to it, and largely extend our operations. We have rented 300 acres at Maffra at £1 per acre, and one of my brothers is just finishing the sowing of that area. We have found that Spring sowing, which is followed in Europe, is a mistake. The time to sow is the month of May. We sow broadcast one and a quarter bushels per acre. We have tried the new variety, 'White Belgian,' the Department of Agriculture is recommending, but we prefer the old variety, 'Riga.' The latter gives a greater quantity of fibre and seed per acre, and, if got in early, there is no fear of the boll worm attacking the seed pods. We had 40 acres hand-pulled this year in order to get absolutely pure and clean seed for the Maffra farm.

METHODS OF CUTTING AND THRESHING.

"We found great difficulty at first," Mr. Wollf continued, "in cutting with the binder. The secret is in keeping the knives sharp. We keep them as sharp as razors, and can turn in now, and knock it down at the rate of 10 and 12 acres a day, the sheaves being beautifully even, and not at all tangled. We find there is really less loss with seed shaking out than with other grain crops. After standing in stooks in the paddock for about a fortnight, it can be either threshed and the straw stacked, or stacked as it is and threshed at leisure. We prefer round stacks, as the heads are bulky, and do not build well into square stacks.

"Our method of threshing is primitive, but we get all the seed out quickly, and without injury. Here it is—just two wooden rollers, two feet diameter each, set one above the other, on spindles. The spindle of the upper one works in slot-holes, with a perpendicular play of about two inches, and to the spindle of the lower one is attached a wooden pulley, and on this is placed a belt from the 5-horsepower oil-engine, which drives the 'breaker' and the 'scutcher.' It is driven at the rate of 140 revolutions per minute. One man feeds in the sheaves without untying them, and another takes them away. The seed is all crushed, and then cleaned ready for the market by being put through an ordinary grain winnower. Two men can thus thresh out about two or three acres per day. We do all our work by contract, after the crop is harvested. We pay 6d. per bushel for threshing, and 2d. per bushel for cleaning, and provide the machinery. A bushel weighs 56lbs.

MANUFACTURING THE FIBRE.

"Our methods of flax manufacture are equally simple. The crop remains in the stacks till about the beginning of March. We then begin carting out and spreading on the grass land. An acre of grass land provides room for two acres of crop. We grow a good length of straw here, averaging about two feet six inches. The bundles, after the seed is removed and untied and spread out evenly in a thin layer on the ground, and if there have been good rains and heavy dews, the straw is ready for turning in a fortnight; the swathes are rapidly turned over with a long pole, and left out another fortnight or three weeks. Then it is gathered up loose in thin round stooks to dry for two or three days, then tied into handy bundles with the binder strings, which are saved for the purpose, and carted and re-stacked close to the shed where the flax is manufactured. We do the tying, carting, and stacking in the afternoon, when the dew is off and the weather dry, and when it is again in the stack it must be kept dry till finally dealt with.

"The 'breaker' and the 'scutcher' we have were both imported for us by Mr. Miller, the rope manufacturer, who buys all our flax and has taken a great interest in the work of flax growing. The 'breaker' cost £35, and the 'scutcher' £40, and both are driven with the oil-engine. The 'breaker' consists of four fluted iron rollers in two sets, which turn half round and back. The straw is passed through between these sets, and they break out the woody material in the stems and leave the fibre with a lot of these woody particles adhering to it, and the 'scutcher,' which is simply a set of wooden blades revolving rapidly past an iron shield, clean these off and leave the fibre ready for market. The fibre is put up in 14lb. bundles and packed in wool bales holding about 5cwt.

LABOUR AND WAGES.

"We employ regularly for months about 12 men and boys, and work in shifts in the factory day and night. All the work is by contract, so you can readily find the cost. Spreading out costs 7s. 6d. per acre; turning over with the pole, 2s.; stooking, re-tying, and carting in, 10s. per acre. And in the factory we pay 10d. per stone of 14lbs. to the men, and we reckon it costs us another 2d. per stone for the engine and the wear and tear. All the work is light: boys can do the breaking and earn 4s. and 4s. 6d. for eight hours. Scutching requires more skill. A good man can earn 7s. a day of eight hours, ordinary hands 6s. Spreaders make about 5s. per day. One advantage to country districts is the amount of light labour it provides. We will distribute in wages this year about £8 per acre, and will net a similar amount for ourselves, and we feel sure that if the industry extends, when the local demand is filled there will be a good field for export both for seed and fibre. But farmers ought to be told that it is no good going into flax-growing unless the work is done thoroughly. The land requires to be well cultivated and free from weeds, and it will not pay to bother with small ots. One merit the crop has is that it is not easily injured by the weather and can be handled at leisure."

Unlimited Markets.

It may be noted that the imports of linseed into Great Britain in 1900 amounted to over four millions sterling; linseed cake for cattle feeding to one million and a half: and flax to over two and a half millions. In 1901 Argentina shipped linseed to Great Britain to the amount of one million and a half sterling, and reports are to hand that some of the Australian harvesters sent over for the first time to that country last year stripped linseed crops very successfully, and now that it has been proved that early autumn sowing is clearly the proper course, the crop should be worth a trial in the northern districts, even for the seed alone.

Small experimental plots of flax have been successfully grown from time to time in the Goulburn Valley and in the Mallee, but they have suffered occasionally from the attacks of the "ball" worm, the larvæ of a small moth which pierces the seed head and destroys the seed, and to obviate this the Department of Agriculture is distributing samples of seed of an early variety known as "White Belgian," which matures before the moth begins to lay its eggs. Mr. Wollf thinks that early sowing in well-tilled land of the ordinary variety of flax, "Riga," is all that is required. The success which has been attained by the Messrs. Wollf in flax growing should encourage the department to persevere in disseminating information on this important industry.—*The Argus.*

POTATO CULTURE.

The following extracts are made from Bulletin 35, issued by the United States Department of Agriculture, and are quite as applicable to this State as America:—

SOIL AND ROTATION.

The potato is grown in every State and Territory, and naturally, on a great variety of soils. Indeed, it has been grown on nearly every class of soil, but this fact does not minimise the importance of selecting for the potato the kind of soil best adapted to it. The ideal soil for this crop should be one so light as to offer no great resistance to the enlargement of the tubers, so supplied with organic matter as to be rather moist without being wet, and so rich as to furnish an unfailing supply of fertilising ingredients. A rich, sandy loam, abundantly supplied with organic matter and naturally well drained, is preferable. Stiffer soils may be rendered suitable for the potato by drainage and by the incorporation of farm manures, or better by ploughing under green crops. Very heavy clay should be avoided if the farm contains any lighter soil. Recently cleared ground suits the potato. Sandy soils, if not too subject to drought, may be fitted for this plant by the addition of organic matter. It is claimed that potatoes grown on sandy land are of better quality than those grown on stiffer soil.

The potato requires a rich soil, but even more important than natural fertility is a proper mechanical condition of the soil. Artificial fertilisers may be substituted in part for natural fertility, but they are effective only when the soil is in such a condition as to furnish a constant supply of water. The potato should have the best soil on the farm, since it is more exacting in this respect than the other staple crops, and since the product of an acre is generally of greater value.

The success of the potato is largely dependent on the crops preceding it in the rotation. If clover, cowpeas, or other leguminous plant is grown just preceding potatoes, its stubble furnishes organic matter, and adds to the store of available nitrogen in the soil. Corn after sod frequently precedes potatoes, and this is generally regarded as the best rotation.

Rye is sometimes sown in late summer or fall and ploughed under so as to lighten a heavy soil. Buckwheat and other plants have also been used for the same purpose. On light soils, and in rather mild climates, crimson clover for green manuring may advantageously take the place of rye where early planting of potatoes is not specially desirable. One year, or at most two years, is as long as a field should be devoted to continuous potato culture, although this crop is sometimes grown for more than two years in succession on the same land. This latter course taxes heavily the fertility of the soil, and necessitates liberal manuring; moreover, it involves considerable risk of injury from fungus diseases, especially from potato scab. A clean crop of potatoes can not, as a rule, be grown on land which, in the preceding year, produced scabby tubers. The germs of the disease once in the soil must be starved out by growing on the infected field other crops, such as grass or grain, for several years. In certain localities in the central part of the United States and elsewhere, the following three years' rotation has given highly satisfactory results on farms where potatoes are extensively grown: Fall wheat, in which clover is seeded in spring; second year, clover, ploughed under in fall or winter; and third year, potatoes. In some localities the uncertainty in obtaining a catch of clover renders this rotation inexpedient.

Detailed directions for the preparation of one class of soil would not apply to others, hence it can only be said that preparation should be deep and thorough, and that unnecessary compacting of the soil should be avoided. Ploughing can scarcely be too deep, provided that much of the subsoil is not brought to the surface; when practicable, the depth should be gradually increased from year to year. Though the tubers are usually formed within six inches of the surface of the ground, the roots feed deeper. At the Utah Station a very large proportion of potato roots were found 12 inches below the surface. At the New York State Station potato roots penetrated to a depth of 34 inches. Girard, in France, measured single roots nearly six feet long growing on rich soil, deeply prepared. (*See* fig. 1, page 58.)

Practical experience, as well as the extent of the distribution of potato roots in the soil, emphasise the importance of deep and thorough preparation of the soil for this crop. Whether fall ploughing is advisable depends on a variety of local considerations. In general, in a mild climate, fall ploughing of light land exposes it to leaching; on the other hand, fall ploughing is sometimes necessary, as, for example, when a field is badly infested with injurious insects.

MANURING.

The potato requires liberal manuring. Barnyard manure usually affords a large increase in the crop, for not only does it supply nitrogen, phosphoric acid, and potash, but it improves the mechanical condition of the soil. However, its direct application to the potato affords conditions favourable to potato diseases, and thus injures the quality of the crop. For this reason the best practice is to apply barnyard manure to corn or grass the year before potatoes are grown. If it is considered necessary to apply it directly to the potato crop it should first be well rotted.

If, for several years before potatoes are planted, the land has been properly manured with farm manures or with green crops ploughed under, commercial fertilisers can be advantageously used on most soils. Generally a complete fertiliser should be used, *i.e.*, one which contains nitrogen, phosphoric acid, and potash. The farmer is justified in supplying all three of these fertilising ingredients unless by previous tests he has learned that on his soil a certain one of them can be safely omitted.

Of nitrogenous fertilisers, one of the best for potatoes is the quick-acting nitrate of soda. Of phosphatic fertilisers, superphosphate is preferred. Among potash fertilisers the sulphate of potash has been found to afford a better quality of potato than kainit and muriate of potash. Ashes are extensively and effectively used to supply potash to potatoes.

Numerous special potato fertilisers are on the market, their chief peculiarity consisting in a higher percentage of potash than is contained in the ordinary brands of mixed commercial fertilisers. American experiments indicate that a fertiliser mixture for potatoes should contain a high percentage of potash.

Since the proper position of fertilisers with reference to the seed pieces doubtless depends on the character of season, soil, and manure, no general rule can now be given further than to caution the reader against applying the fertiliser in immediate contact with the seed piece.

The following are among the most widely grown varieties:—Early—Early Ohio, Early Rose, Beauty of Hebron, and Triumph; medium and late—Burbank, Rural New Yorker No. 2, Empire State, Mammoth Pearl, White Star, and Dakota Red.

These are standard varieties, and though not necessarily the best, they seem to have given general satisfaction.

PLANTING.

General Directions.

The rows should be laid off as close together as practicable without interfering with horse cultivation. Generally the seed pieces should be dropped in furrows made in the level field and not on ridges. However, low ridges are advantageous for an early crop and on poorly drained land. In covering the seed pieces, whether they are planted flat or on ridges, it is well to leave a small, sharp ridge marking the line of the row. In some localities, however, where excessive moisture is not feared, the opening furrows are only partially filled after planting, leaving a depression along the row to be filled by the use of the smoothing harrow or other implement. In planting late in the season this course is sometimes advisable.

The pieces may be dropped by hand in the open furrow, or a potato planter may be used, dropping and covering the seed pieces at one operation. There are several potato planters that do very satisfactory work, but their cost restricts their use to those who plant a large acreage in potatoes, or to cases where several farmers can use one together. Their more extended use is perhaps desirable, since they save a considerable amount of labour and enable the potato grower to take full advantage of even a brief period of favourable weather at planting time, regardless of scarcity of labour.

There is not sufficient evidence now available to determine whether there is any difference in yield due to the cut surface of the set being placed upward or downward when planted. Probably there is no loss in letting the seed pieces fall as they will from the planter or from the hand.

In the preparation of the ground and in planting, the earth along the line of the row should be compacted as little as possible consistent with thorough work, and hence the team should be made to walk between the rows whenever possible, instead of along the drill. There is a simple potato coverer constructed somewhat like a triangular snow plough, with the wide end forward and a portion of the point or apex cut away so as to leave a narrow opening at the rear. No special implement, however, is required for this purpose.

TIME OF PLANTING.

Each community is the best judge of the proper date for planting. Where potatoes are grown for the early market the aim is to plant as early as possible, without subjecting the young plants to severe cold. The crop should be planted at such a date as to bring the stage of growth during which the tubers are rapidly developing at a time when there is ordinarily an adequate supply of moisture. The month when dry weather is most certain varies with the locality, and each potato grower should so time his planting as to be least affected by drought. Where the growing season is long, the crop that is to be stored over winter should be planted very late, so that it may remain in the ground until cool weather. On the other hand, where the season is short, late varieties should be planted in time to ripen before frost.

DEPTH OF PLANTING.

The roots of a young potato plant grow, not directly from the seed piece, but from the underground joints or nodes of the stem. From these underground nodes also grow the short stems which bear the tubers at their extremities. (*See* fig. 1, page 58.) Hence the seed pieces should be placed deep enough in the soil to permit several of these joints to form below the surface, so as to afford room for an ample supply of roots and tuber-bearing stems to grow.

Many experiments have been made to ascertain the best depth for planting. The results, with some exceptions, favour planting not less than four inches deep. The favourable effects of deep planting were especially marked on well-prepared, friable soil and in dry seasons.

Very deep planting is open to objection because of the increased labour of harvesting and the danger of a deficient stand when weather conditions are unfavourable. Very shallow planting reduces the yield and injures the quality of the crop.

THE RURAL TRENCH SYSTEM.

The rural trench system consists in planting the pieces in deep trenches made either by the spade or plough. It differs from other methods chiefly in the greater care taken to secure a thorough preparation beneath the potato. To this end after deep and wide trenches are formed the bottoms are pulverised and a portion of the fine earth which was removed in forming the trenches is raked back into the furrows, so that the set is planted on top of a layer of fine, well prepared soil and at a depth of four to six inches. Fertilisers are placed near the seed pieces above or below, but separated from them by a thin layer of soil. The trenches are then filled and level culture is practised.

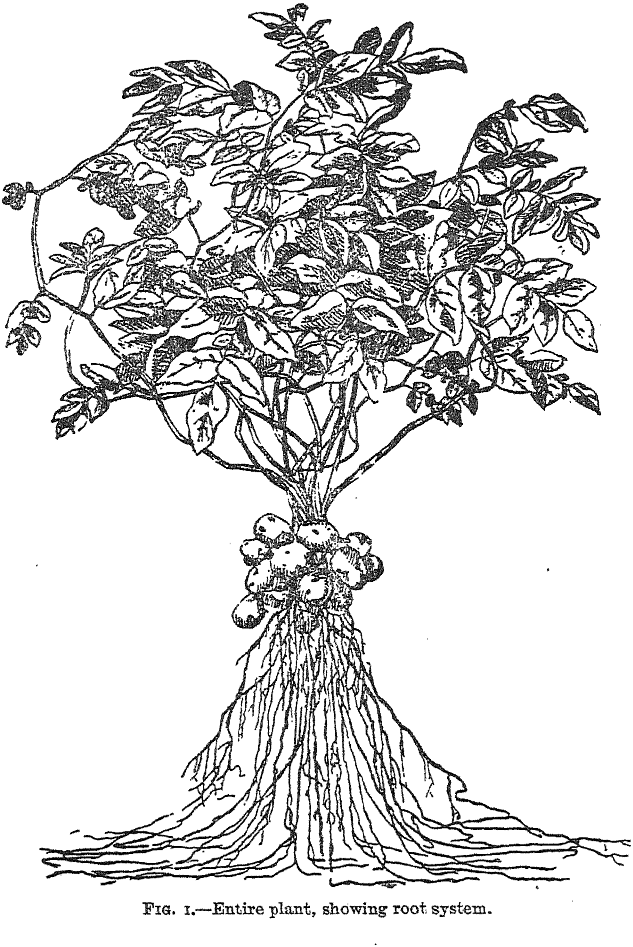


FIG. 1.—Entire plant, showing root system.

TIME TO CUT SEED POTATOES.

At least three American experiment stations have conducted tests to learn the effect of cutting seed potatoes several days or weeks in advance of planting. The results varied somewhat according to the length of time that the cut sets remained unplanted, but on the whole indicated no marked difference in productiveness between planting freshly cut pieces and those that had been cut for a week or less.

The investigations of Kraus and of Wollny, in Germany, led to the conclusion that a slight wilting of the seed pieces increased the yield on moist soils and in wet seasons, but reduced it on soils not retentive of water and in dry seasons.

On the whole it appears that the storing of cut pieces for several days, which sometimes becomes necessary, is attended with no great disadvantages. Of course due care should be taken in such instances to prevent heating, and it may be well to dust the cuttings with gypsum (land plaster) to prevent excessive wilting.

CHANGE OF SEED.

To test the effect on the yield of using seed potatoes from different localities, several varieties of potatoes, grown in Vermont and in Maryland, were planted in both States. The seed grown in Vermont gave larger yields both in Vermont and in Maryland than seed grown in Maryland.

It has been found advantageous to change seed potatoes every few years, but from the small amount of definite experimental data now available, we believe no final conclusion can be drawn as to the effect of the practice. To make the change, tubers of the desired strain may be sent to a grower at a distance, and after two years' culture under new conditions, the stock may be brought back to its original home.

A common practice in the regions where a second crop can be grown on the same land in the same year, is to plant in the spring a small area with Northern seed potatoes, replanting the resulting tubers in July or August, and using the crop produced in the fall for the main spring planting. By this course seed is renewed frequently without sacrificing any of the advantages resulting rom the use of second-crop seed stock, such as freedom from sprouting, etc.

SEED END v. STEM END.

When potatoes are cut in half through their smaller diameter, we have seed or bud end more or less crowded with eyes and a stem or butt end on which there are few eyes (*see* fig. 2, page 64). The experiments to determine the relative values of cuttings from the stem end and from the seed end of the tuber have been numerous. The majority of these showed that the yield was greater when the seed end was used. The superior productiveness of the seed end as compared with the stem end was maintained, whether the halves of the potato, the thirds, or smaller cuttings were employed.

In a few instances, however, the results suggest that the general superiority of the seed end may not be maintained with some varieties and with immature seed tubers.

EFFECT OF SPROUTING.

The growth of sprouts before planting is made at the expense of the tubers from which they draw their support. Hence if these shoots are rubbed off before planting, there is a total loss of the nutriment contained in them. Moreover, numerous weak shoots grow from the injured eye. To prevent these evil consequences of premature sprouting, seed potatoes are stored in a dark, dry, cool place. In spite of all precautions the tubers sometimes sprout; but when practicable, only potatoes that have not sprouted should be selected for planting.

If the eyes appear dormant in spring, seed potatoes may be exposed to the light and warmth for a few days before planting, so as to promote germination and prompt growth. If long exposed, sprouts will form and careful cutting and planting by hand become necessary so as to avoid breaking off these sprouts.

QUANTITY OF SEED POTATOES PER ACRE.

A bushel of potatoes (60 pounds) may contain 240 quarter-pound tubers. When the seed pieces are planted a foot apart in three foot rows an acre requires 14,520 sets. When tubers averaging four ounces are employed an acre requires at these distances 60 bushels for planting whole potatoes, 30 bushels when halves are used, and 15 bushels when quarters are planted. In a number of tests the amount of seed cut to two eyes, spaced one by three feet, averaged 13 bushels per acre, the usual range being from 10 to 14 bushels. In 18 experiments with many varieties the average amount of seed cut to single eyes was at these distances 6·3 bushels per acre, the usual range being from five to seven bushels, though the varieties with large tubers bearing few eyes required considerably more seed.

Results which follow in these pages suggest that it is generally advisable to plant at least 15 to 30 bushels per acre.

SIZE OF SEED PIECES.

In the size of the seed piece planted the practice of different farmers varies widely, some advocating a liberal use of seed and others claiming equally good results from small cuttings. To aid in settling this question the State agricultural experiment stations have made numerous tests of seed pieces of different sizes. Taken separately, these experiments show a certain amount of divergence in results, as might naturally be expected of tests conducted under widely different conditions. However, the majority of these tests, and especially the figures expressing the average results of all available American experiments, may be safely taken as indications of what the farmer, under ordinary conditions, will generally, but not always, obtain.

The effect of size of seed pieces on yield of crop will be treated here under three distinct heads, (1.) on the total yield; (2.) on the gross yield of saleable potatoes; and (3.) on the net yield o saleable potatoes, *i.e.*, after deducting the amount of seed planted.

EFFECT ON TOTAL YIELD.

In making up the averages below it was found practicable to use the results of 19 tests of single eyes *v.* two-eye pieces, four tests of two-eye cuttings *v.* quarters, 17 comparisons of quarters and halves, and 44 tests of halves *v.* whole potatoes. The results of other experiments less completely reported were used for the purpose of corroboration.

The following table shows the average results of these tests, including potatoes of all sizes:—

Average differences per acre in total yields from different seed pieces.

—	Bushels.	Per cent.
Excess from use of—		
Two-eye pieces over one-eye pieces ...	26	21
Quarters over two-eye pieces	15	16
Halves over quarters	24	18
Whole tubers over halves	31	18

If we compare all the total yields with the total yield produced by single eyes we have an increase of 21 per cent. for two-eye pieces, 41 per cent. for quarters, 67 per cent. for halves, and 96 per cent. for entire tubers. The total yield resulting from planting whole potatoes is practically double that obtained by planting single eyes.

Thus far we have considered only the total yield, *i.e.*, large and small potatoes, and have found that the total yield increases somewhat uniformly as the size of the seed piece is increased. Hence, if it is the aim simply to secure an enormous yield without much regard to expense, in contests for prizes, etc., a lavish use of seed is justifiable. The farmer and gardener, however, have to consider other factors than the total yield, for a heavy crop may consist very largely of tubers too small for the market, or the greater expenditures for seed when large pieces are planted may more than counterbalance the increased yield. Before noting the gross and net yields of large or salable tubers, resulting from seed pieces of different sizes, we may consider the causes inducing a somewhat regular increase in total yield accompanying the use of larger seed pieces.

Several causes operate to increase the yield when large seed pieces are planted. The larger the cutting the greater generally the number of eyes and the number of stalks. The young shoot before it developes a strong system of feeding roots, is dependent for nutriment on the material stored up in the seed piece; hence the more abundant the supply the more vigorous the growth of the plant, and this increased luxuriance is not confined to the early stages of growth, but is marked throughout the growing season. Investigation has shown that severing the connection between the seed piece and the growing vine, even after the latter is thoroughly rooted, reduces the yield of potatoes.

The danger of partial or entire failure resulting from an imperfect stand is much greater with small cuttings than with large seed pieces. The small pieces with extensive cut surfaces are liable to perish should the season be unfavourable, either through excessive moisture or drought. The sprouts from small cuttings being weaker, reach the surface with difficulty, or fail entirely on soil not properly prepared.

EFFECT ON GROSS SALEABLE YIELD.

By averaging the results of the experiments referred to above, we find that the actual increase in the potatoes of saleable size due to using larger seed was as follows:—

Average differences per acre in gross saleable yields from different seed pieces.

—	Bushels.	Per cent.
Excess from use of—		
Two-eye pieces over one-eye pieces ...	23	21
Quarters over two-eye pieces	10	15
Halves over quarters	15	15
Whole tubers over halves	14	10

Every increase in the size of the seed pieces was followed by an increased gross saleable yield.

EFFECT ON NET SALEABLE CROP.

Before concluding that the largest seed pieces are the most profitable, it becomes necessary to deduct from the crop the amount of seed planted. It is plain that the increased amount of seed potatoes required when larger pieces are used may more than counterbalance the increase in yield obtained.

The true test of profit is the market value of the crop produced, less the cost of seed planted. Should the quantity of seed potatoes used be substracted from the total yield of large and small potatoes, or from the saleable crop? If small or unsaleable seed potatoes are planted, then the former course is the proper one, but since large or medium tubers (either entire or cut) are generally selected for seed purposes, it seems best to subtract the seed from the saleable crop, thus ascertaining the net saleable yield.

The following table shows the actual average results for the net saleable yield; that is, the crop after deducting the small potatoes and the seed used:—

Average differences per acre in net saleable yield from different seed pieces.

—	bushels.	Per cent.
Excess from use of—		
Two-eye pieces over one-eye pieces ...	15·0	14
Quarters over two-eye pieces	7·0	15
Halves over quarters	5·0	6
Halves over whole tubers	8·5	8

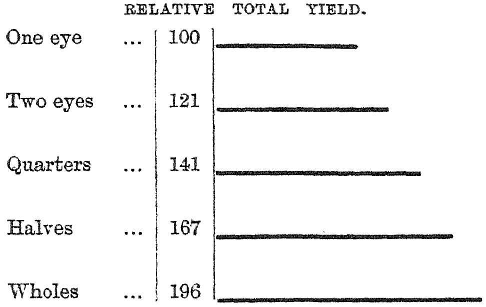
The amount of the net saleable crop rose with the increase in the size of the cutting employed, but when the whole potato was planted the figures declined on account of the large amount of seed potatoes which had to be deducted. The above figures indicate a very slight advantage in planting halves, rather than quarters, when the price of seed and of crop produced are the same. As a matter of fact, spring prices are usually somewhat higher than fall prices. A high price for seed potatoes may make it profitable to plant smaller pieces (as, for example, quarters) than would be economical where seed and crop command the same price per bushel.

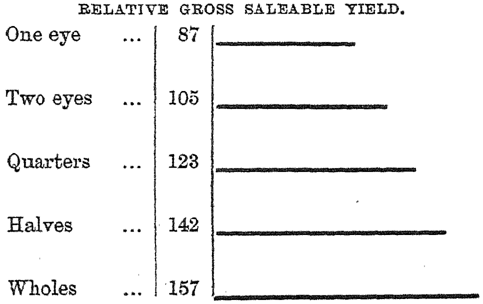
GENERAL CONSIDERATIONS ON THE AMOUNT OF SEED POTATOES.

In the following diagram 100 represents the total yield from planting single eyes. The figures may be read as bushels per acre, if it is constantly borne in mind that we are talking about soils of such character as to average 100 bushels of large and small potatoes per acre when planted with one-eye pieces.

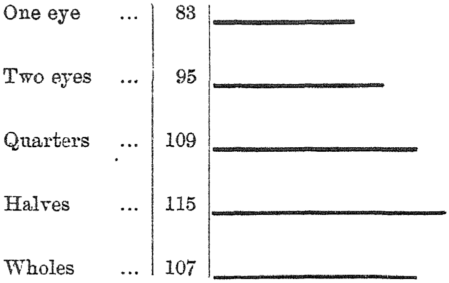
The first group answers the question, "What size of seed piece generally affords the largest yield of large and small potatoes?" The second group answers the query: "What size of seed piece generally gives the greatest yield, exclusive of small potatoes?" The third group offers an answer to a still more important question: "What size of seed piece generally produces the largest yield after deducting both the small potatoes and the amount of seed planted?"

Yield from planting different seed pieces, assuming 100 as the total yield from single eyes.





RELATIVE NET SALEABLE YIELD.



One eye ...	83
Two eyes ...	95
Quarters ...	109
Halves ...	115
Wholes ...	107

Taking as the correct measure of profit the yield of saleable potatoes, less the amount of seed used, we see by the third section of the diagram that, with seed and crop at the same price per bushel, it was more profitable in these tests to plant halves than smaller cuttings and whole potatoes.

If we take account of the yield of small potatoes the advantage of large seed pieces is even greater than the figures in the last section of the diagram would indicate, for the yield of small potatoes is greater with large than with small seed pieces. Where large quantities of small potatoes can be profitably utilised, as for example as seed for the second crop, the potato planter may therefore use quite large seed pieces with advantage.

On the other hand, the higher price of potatoes in spring than in fall is an argument in favour of planting quarters rather than halves or whole tubers. A number of investigators have noted that large seed pieces (either large cuttings or entire potatoes) afford an earlier crop than very small cuttings, a matter of much interest to growers of early potatoes. However, some growers have reported that uncut potatoes germinate more slowly than large cuttings. Most of those who raise potatoes for the early market use large cuttings rather than whole potatoes.

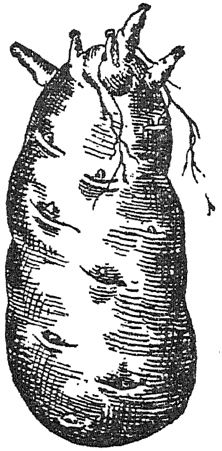


Fig. 2. — Tuber, showing arrangement and order of sprouting of eyes,

In this connection it may be said that the seed-end half gives an earlier crop than the other half. This suggests the expediency of cutting a potato lengthwise when halves or quarters are to be planted, thus securing on each piece one or more of the eyes which germinate first. Another advantage of cutting lengthwise is that it insures a more even distribution of the eyes on the several pieces. Of course this system is not practicable when very small cuttings are to be made from long, slender potatoes, since the large amount of exposed surface would render the long pieces susceptible to injury both from moisture and dryness.

If it is desired to cut the potato into small pieces the operator should begin at the stem end, and the pieces should be cut in a compact shape and of as nearly equal size as is practicable without leaving any piece entirely devoid of eyes. There are special implements for cutting potatoes, and their use is reported as enabling a man to cut four or five times as many bushels of seed per day as by hand. The character of the work is said to be satisfactory.

No definite rule can be given as to the best size of seed piece, for this depends somewhat on the distance between the hills and the character of the soil and season. Another important factor in determining the proper amount of seed is variety. Some varieties are able to produce a crop almost as large from small cuttings as from large pieces. Thus, in several experiments, the variety Clark No. 1 has given indications of this capacity to produce well even with light seeding.

Size of Seed Tubers.

A study of more than a hundred experiments testing the relative values of large, medium, and small uncut tubers confirms the general law that an increase in the weight of seed planted affords an increase in the total crop. The yield of saleable potatoes increases less rapidly than the total yield. With whole potatoes as seed the saleable yield reached its extreme upward limit in one test when tubers weighing about half a pound were planted; in another when those weighing four and a-half ounces were employed. The limit of profitable increase was reached with tubers weighing four and a-half and three ounces respectively. The size of seed tubers selected becomes a matter of importance when they are to be cut, for we have seen that the heavier the cutting the larger the total yield, and seed tubers for cutting should be of such size that their halves, quarters, or other divisions shall not be extremely small.

Can Small Potatoes be profitably used for Planting?

Whether or not to use uncut small potatoes for seed is an important question on which farmers are divided. Some present the plausible argument that the use of undersized potatoes results in degeneration. If this claim is based on the results of experience it should determine practice, but if the conclusion is simply a generalisation based on the fact that large seeds usually give best results the reasoning is defective, and the question remains open. The potato tuber is not a seed, but an underground stem, and the relations existing between seeds and their progeny do not necessarily exist between a tuber and its descendants. Others hold that potatoes just below marketable size, if shapely and sufficiently mature, may be used without serious deterioration, and that for economic reasons their use is especially desirable, because if not planted or used at home they must be lost or fed to stock, for which purpose their value is usually smaller than the market price.

The results of tests at a number of experiment stations have uniformly indicated that small tubers uncut can be used for seed purposes without detriment to the succeeding crop. It may still be urged, however, that the choice of small seed year after year will result in degeneration. On this question the information is meagre, but two experiments, extending over four and eight years respectively, have been reported in which no degeneration resulting from the continued use of small potatoes from the preceding crop was apparent.

Although the evidence seems fairly conclusive that small uncut seed potatoes may sometimes be used with profit, we cannot advise that small seed tubers be selected year after year from a crop which has been grown from small potatoes.

Girard's investigations in France justified the practice of the most prominent agriculturists and horticulturists in carefully selecting seed potatoes. By selecting for several generations average-sized tubers from the best hills he effected a considerable improvement in productiveness. To ascertain the best hills by digging each is exceedingly laborious, but Girard found that the best hills in an evenly manured field containing only one variety were those in which the vines were most vigorous. Selection was thus rendered easy by means of stakes placed besides the luxuriant plants. This correspondence between the vigour of vegetation and yield of tubers has been frequently noted at the State agricultural experiment stations, especially with seed pieces of different sizes, in which case the growth of vines is in proportion to the size of the seed piece planted. American experiments indicate some advantage in selecting seed tubers from the most productive hills.

Potatoes of irregular shape and injured tubers should be rejected as unfit for planting.

NUMBER OF EYES AND WEIGHT PER SET.

Many potato growers cut tubers into pieces containing one, two, or more eyes, laying greater stress on the number of eyes than on the size of the cutting. Extensive experiments at the Indiana station and elsewhere prove that of the two factors, number of eyes and weight of piece, the latter is the most important. Of course, it is desirable that each piece, whether large or small, should contain at least one eye, and it has been generally profitable for it to be of such size as to contain at least several eyes; but whether it has one eye or many eyes it is important that the seed piece be heavy enough to furnish abundant nutriment to the shoots which spring from it. A single eye may give rise to several stalks, for each eye is a compound bud, or cluster of buds. An eye can be bisected, and each half may then grow successfully if it is not a victim to dryness or decay, to which its exposed conditions subject it.

In one series of experiments it was found that the number of stalks growing in a hill was less dependent on the number of eyes than on the size of the seed piece, whether cut or entire. In general, as the number of eyes per piece increased each eye became less prolific in sending up stalks, so that there was less crowding of stalks where large seed pieces with many eyes were used than would be expected from the large number of eyes planted. After numerous experiments touching on almost every aspect of this subject the investigators advised that tubers be cut so as to make each piece of a constant size or weight, whatever the number of eyes that might fall to its share.

NUMBER OF CUTTINGS PER HILL.

A custom not uncommon among those who plant small cuttings is to drop two pieces in each hill. They usually get a larger yield by so doing than by planting single pieces, the increase generally, though not always being sufficient to pay for the excess of seed. This does not prove the practice profitable, for better results may be secured by planting a single piece weighing as much as the combined weight of the two pieces which would have been dropped in one hill. Thus the labour of cutting is considerably reduced, and, what is more important, larger pieces improve the chances of getting a good stand in an unfavourable season, because they have less exposed surface than two small pieces of equivalent weight, hence are less liable to dry out excessively when drought follows planting; they are also better able to resist rotting if wet weather prevails.

NUMBER OF STALKS PER HILL.

The most common objection urged against planting large seed pieces is, next to the expense, the danger of having the hills so crowded with stalks, and consequently with tubers, that a large proportion of the potatoes never develop to marketable size. This objection is probably valid for entire tubers, and also for halves planted very close in the row. The evidence available does not permit us to conclude that in the case of quarters used as seed there results any injurious crowding, and it may be questioned whether halves give rise to this trouble when planted under favourable conditions and at considerable distance apart.

The number of stalks that can be advantageously grown in each hill varies greatly with variety, season, soil, and distance apart. At the Indiana station it was found that when uncut tubers of one to five ounces were planted in hills three feet apart the gross yield of large potatoes and the net yield of large potatoes increased with every increase in the number of stalks per hill up to nine stalks for Burbank and eight stalks for Beauty of Hebron, growing in both cases from tubers weighing four and a half ounces. Eight stalks per hill would probably be excessive for distances less than three feet each way. In experiments in Maine, extending over several years, six stalks per hill gave larger yields than four or two stalks, the amount of seed planted being the same in each case.

As to the effects of thinning the stalks, recorded experiments are inconclusive, and with ordinary seed pieces it appears to be unnecessary.

DISTANCE BETWEEN PLANTS.

In deciding on the proper distance at which to plant potatoes it is necessary to take into consideration the size of the seed piece that is to be employed. In general small seed pieces should be planted close and the distance allotted to each hill should be greater as the weight of the piece is increased. Close planting for small cuttings is best attained, not by narrowing the row to less than about two and a-half or three feet (for if the distance is much less horse cultivation becomes difficult), but by planting the seed pieces close together in the row.

To frame a general rule giving best distances for seed pieces of different sizes is plainly impossible, for the distance at which the largest yield is obtained depends also on the variety, the season, the soil, and the fertilisers. However, the results of some of the investigations covering this matter afford help in deciding on the proper distance under varying conditions.

It has been shown that if very small cuttings are used, and if the soil is fertile, the distance can be reduced to six or nine inches without sacrificing the yield, provided the season happens to be favourable, but this is not generally advisable.

On rich soil cuttings of considerable size can be advantageously planted as close as 12 inches.

Checking effects a saving of labour in cultivation, and also in planting and harvesting, when these latter operations are performed by hand, hence expensive labour and the absence of machines for planting and harvesting the crop are conditions in favour of checking. For planting in checks a variety can be chosen which makes a large growth of vines and which forms many tubers in each hill, thus more completely utilising the space at his disposal than could a variety with small vines and few tubers. In checking there is danger on rich soil that some of the tubers may grow to an objectionable size. Potato-growers, in attempting to obtain a phenomenal yield, as in contests for prizes, almost universally plant in drills rather than in hills, and place the seed pieces from 8 to 15 inches apart.

The advocates of planting in drills claim that by this method a larger yield can be obtained, and experience seems to confirm the correctness of this view. The few experiments that have been made on this question are not entirely conclusive, though the majority of them favour drills.

Although no fixed rule regarding distance of planting can be given, the following general considerations are widely applicable :—

(1.) For maximum yield of saleable potatoes plant in rows as narrow as can be conveniently cultivated.

(2.) Crowd small seed pieces close together in the row, increasing in the distance with every increase in the size of the seed piece; avoid on the one hand such close planting as to greatly reduce the average weight of the tubers, and on the other such wide spacing as to leave any considerable portion of the soil unshaded by the full-grown vines.

(3.) As a rule the richer the land the less the required distance between sets.

(4.) Varieties with strong growth of vines, or which set many tubers in a hill, should have greater distance between plants than is necessary with less vigorous varieties.

CULTIVATION.

Soon after planting, and again just as the young plants are beginning to appear above ground, the field should be harrowed, inclining the teeth of the harrow backward. This is a cheap method of cultivation, since a wide space is covered. It is also effective in destroying small weeds, in levelling the ridges left in planting, in preventing the formation of a surface crust, and in keeping the land covered with a mulch of dry earth, thus conserving moisture within the soil below. Subsequent cultivation should be frequent so as to accomplish these same ends. Almost any pattern of cultivator may be used, provided it is made to do shallow work. However, if the ground has become packed, the first cultivation may be deeper. Experience and exact experiments generally favour flat or nearly flat cultivation. Excessive hilling during cultivation intensifies the injurious effect of dry weather. It also results in breaking many of the feeding roots between the rows. The frequent use of the cultivator should be substituted as far as possible for hoeing. If a severe frost is apprehended soon after the plants come up the tops should be covered by throwing a furrow to each row.

MULCHING.

While mulching with hay, straw, leaves, or other litter frequently increases the yield and is specially valuable in tiding over a season of drought, it is not generally practicable on farms where potatoes are grown on a large scale. Its place is in the garden rather than in the field. It is a substitute for cultivation, and it is generally cheaper to maintain a soil mulch by frequent cultivation than to apply litter. If a mulch is employed it can be applied over the entire surface or in the furrow above the seed pieces, or between the rows. Mulching in the furrow is not commended by the results of tests in Colorado, Louisiana, and Michigan. In striving for a large yield, with little regard to cost, or to insure against drought, mulching is useful.

Material intended to serve as a mulch should first be exposed to the weather so as to cause the sprouting of any seed it may contain. It is better to apply a mulch after potato plants have made some growth, as an earlier application may result in smothering some plants and in injury from late frosts.

HARVESTING AND STORING.

The death of the vines is the signal for digging the main crop. For the early market potato growers do not wait for this but are governed by the size of the tubers. As long as any portion of the vine is green the tubers can continue to grow. At the Vermont station White Star potatoes, planted May 20th, yielded 163 bushels per acre of merchantable potatoes when dug August 22, 234 bushels September 1, 303 bushels September 12, and 353 bushels September 22. More than one-third of the merchantable crop was made after September 1. At the above dates the average size of all tubers was, respectively, 3·7, 4·4, 5·2, and 5·7 ounces respectively. These figures show the importance of protecting the foliage from the late blight by spraying, and they also afford some data as to the rate at which potatoes develop late in the season.

In gardens very early potatoes are sometimes obtained by carefully removing a few of the larger tubers from the growing plant, replacing the soil and allowing the smaller potatoes to continue growing ("grabbling"). Experiments conducted in Germany by Wollny and Nobbe, and in Austria by Leydhecker showed little or no loss as a result of this operation carefully done. The large amount of labour required prohibits "grabbling" except when early potatoes are selling at a price very much higher than can be expected from the later crop.

In harvesting a large area a high-priced potato digger is frequently used; hand digging with a four-tined fork is probably the best method on small areas, though many make use of a potato hoe or of a plow. Careful handling always pays, and extreme carefulness is necessary, especially with the early crop, to prevent injury to the tender skin of the immature potatoes.

In harvesting, as well as in storage, potatoes should be exposed to light as little as possible. In storing potatoes a low temperature is required. The potato tuber is uninjured by a temperature of 33 deg. F., and one authority gives the freezing temperature of potatoes 30·2 deg. F. Warmth favours sprouting, which injures potatoes both for planting and eating.

SECOND-CROP POTATOES.

In most of the territory south of Maryland, Kentucky, and Kansas two crops of potatoes are frequently grown in one year on the same land. In the warmer portions of these three States, and indeed a little farther north, a second crop can sometimes be produced. The agricultural experiment station at Manhattan, Kans., had fair success when 225 days elapsed between planting the first crop and digging the second, but a growing season of 195 days proved too short for two crops.

The second crop is grown by methods somewhat different from those employed with the main crop. Small potatoes from the early crop are extensively used for seed, and these should be planted whole (or with only a small slice removed), for when cuttings have been planted in August or September a poor stand has generally resulted.

It is best to allow the crop which is to furnish seed potatoes for the second crop to remain in the ground until the vines are entirely dead. However, the culls may be used even when the early crop is dug before complete maturity. To prepare these culls for prompt growth and to eliminate those too immature to sprout, the small potatoes are exposed to the light in a shady place for several days, or until they become greenish; then they are spread out on the ground in a single layer and a little fine dirt sifted among them, covered with straw or pine needles, and the bed kept constantly moist. "The potatoes will sprout earlier if before bedding them under the straw a small piece is clipped off one end and rejected."

Planting time varies from the last of July in Virginia to September in Florida. For the Gulf States, and others with similar climate, the usual time for planting the fall crop is the first half of August. Plant without ridging in furrows about six inches deep. In the bed select only the potatoes that have sprouted. Drop them in the freshly opened and moist furrow, cover at once with about an inch of soil, leaving a depressed row to be filled by subsequent cultivation. In covering with the hoe, the man should walk in the row, and thus compact it. Professor Massey recommends the use of a home-made coverer, consisting of an ordinary plow beam and handles, with a cross bar in front, to which are attached two spiked teeth a foot apart; behind these teeth is a roller. By planting deep the moisture of the soil is made available to the young plants, and by covering lightly prompt growth is insured. For the second crop an early variety should be employed.

The advantage of second-crop potatoes is their superiority in keeping qualities. In a warm climate potatoes dug in June or July cannot well be kept without sprouting, and thus injuring their value for eating and planting, while the second crop, dug in October or November, can be kept perfectly through the winter and late into the following season.

Recently the claim has been made that second-crop potatoes excel ordinary potatoes for seed purposes. It is undoubtedly true that unsprouted second-crop seed potatoes are better than sprouted potatoes from the main crop. This makes the use of second-crop seed popular in portions of the south, where unsprouted seed potatoes are difficult to obtain. Recently experiments at the Kansas experiment station indicate a superiority for second-crop seed even as far north as Manhattan, Kans. There in 1890 second-crop seed produced a crop 27 per cent. larger than main-crop seed of the same varieties; in the following year the excess was 70 per cent. in favour of seed potatoes of the second crop.

Whether or not the continued use of second-crop seed propagated by means of culls results in degeneration seems at present an open question. Many successful growers have enjoyed second-crop seed for a number of years in succession. Many of those who grow early potatoes for market use northern seed in spring to obtain potatoes for planting the second crop, which in turn is intended as seed for the next early crop. Thus the advantages of second-crop seed and of frequent renewal of the stock are secured.

SUMMARY.

1. A rich, sandy loam, well drained and well supplied with vegetable matter, is the best soil for the potato. Stiffer land may be improved as a potato soil by green manuring and drainage, and lighter soils can often be made sufficiently rich by the addition of green manures and fertilisers.

2. Potatoes should not, as a rule, be grown continuously on the same land, but should be alternated with other crops. Barnyard manure may be freely used, but should, as a rule, be applied to previous crops in the rotation.

3. If commercial fertilisers are used a mixture containing nitrogen in form of nitrate of soda, phosphoric acid as superphosphate, and potash as sulphate, and in which phosphate predominates, is recommended.

4. Preparation of the land should be deep and thorough.

5. Planting without ridging generally affords the larger yields, but a stiff soil and the desire for an extra early crop sometimes necessitate planting on ridges.

6. The best time for planting depends on the climate of each locality; the planting should be so timed as to bring the period when the tubers are rapidly forming at a date when the average rainfall is ample.

7. On mellow, well-drained soil deep planting (three to five inches) is best, especially when the season happens to be dry. For the early crop, or on stiff soil with a tendency to bake, the depth of planting may be decreased.

8. The use of the harrow before the plants are all up and frequent shallow cultivation afterwards until the vines shade the land are advisable.

9. Seed potatoes grown in New England in several tests proved superior to Maryland seed both in New England and in Maryland. However, the data seem insufficient to determine definitely the relative value of seed potatoes from different climates.

10. Cutting the seed pieces a few days before planting appears to exercise no injurious influence, provided, of course, that the cuttings are carefully stored in the interim.

11. The yield from planting the seed or bud end is generally greater than from the stem or butt end of the tuber. The eyes on the seed end are the first to germinate, and hence are especially important when an early crop is desired.

12. Exposing unsprouted tubers in a warm place before planting hastens growth, but if continued until sprouts form (which are rubbed off) the yield may be considerably reduced.

13. Experiments indicate that it is more important to cut the tuber into compact pieces of nearly uniform size than to so shape the pieces as to have a definite number of eyes on each set. Each piece should be large enough to support at least two eyes, and better, three or more.

14. At distances of one by three feet, and with seed tubers averaging four ounces, an acre requires of quarters about 15 bushels.

15. The total yield increases with every increase in the size of seed piece from the single eye to the whole potato; this increase occurs both in the large and in the small potatoes, but chiefly in the latter.

16. The gross yield of saleable potatoes (large and medium) also increases with the size of the seed piece from one eye to the whole potato.

17. The net yield of saleable potatoes (found by subtracting the amount of seed potatoes and the yield of small potatoes from the total yield) increases with every increase in the size of seed piece from one eye to the half potato. The half potato affords a larger net saleable crop than the whole potato on account of the excessive amount of seed required in planting entire tubers. Taking the average of many experiments it was found that for every 100 bushels of net saleable crop grown from single eyes there were 114 bushels from two-eye pieces, 131 bushels from quarters, and 139 bushels from halves, but only 129 bushels from planting whole potatoes.

18. These results favour the use of halves as seed pieces if seed potatoes and crop are assumed to be of equal value per bushel, but when seed potatoes command a very high price quarters may be used to advantage.

19. Large seed pieces afford an early crop and are less liable to result in a deficient stand or entire failure, which, in unfavourable years and poorly prepared soil, is sometimes the fate of small pieces.

20. With judicious planting there is probably no necessity for reducing the number of stalks per hill by thinning.

21. It is better to place in a hill one large piece than several very small ones of the same aggregate weight.

22. Distance, variety, character of soil, and numerous other conditions are factors in determining the most profitable amount of seed. The distance allowed each piece should increase with the size of the piece, and should be greater with varieties with rank growth of vines and numerous tubers than for less vigorous varieties.

23. Small potatoes can sometimes be used for seed with profit, in which case they should be planted whole. Leading growers are careful to select for seed medium to large tubers of good shape, and their example should be followed.

24. In harvesting, it pays to handle potatoes carefully, and this is especially necessary for early potatoes dug before the vines are completely dead, and while the skin is tender. Removing the largest tubers by hand, before growth ceases, does not necessarily reduce the yield, but is practicable only on small areas.

25. Darkness and a low temperature are the primary requisites in the successful storing of potatoes.

26. In warm climates a second crop can be obtained within one year by planting sprouted whole potatoes in midsummer.

BEES AND HONEY.

Writing in regard to the preposterous stories which get into the papers in regard to "tons of honey" found stored by bees in caves and hollow trees, J. W. Rouse, writing to the *Farm and Orchard,* says:--

"Bees congregate in colonies or swarms, as they are called. When they settle down to business they have one queen or mother bee to the colony. It may happen in swarming time that two or more swarms will unite, but when they get down to business all the queens will be killed but one, and the colony will then depend for population in bees on what this one queen can produce; so if there should be a bushel or more of bees in a swarm, they would soon be reduced to what the one queen could produce, as the life of a bee in the working season is short. About 45 days from hatching, the queen must be a good layer of eggs in order to keep up a good population of the colony. Most queen bees will only produce eggs to keep up the population of the hive to from 40,000 to 60,000 bees. There are many queens that will not do even so well as mentioned, while in a few cases there are some that will have a population of

75,000 to 80,000 bees to the colony. These last figures would give a large colony of bees—about a half-bushel. An average swarm will weigh from 6lbs. to 8lbs. The writer once had a swarm that weighed 15lbs., which was the largest we have ever seen, except where two or more swarms united.

"Bees at swarming time will weigh one pound to the 4,000 bees. They are then filled with honey; after they empty the honey they will weigh one pound to the 5,000 bees. There is no guess-work about this, for it has been tried and tested.

"There is just as much difference in queen bees as there are in milk cows—some are good and some are not, and will not pay for their keeping. Some queen bees produce only enough bees to keep the colony alive and no surplus honey, while others produce surplus honey.

"It is almost useless for anyone to try to keep bees in common box hives or log gums. When there was a very large flora of wild flowers bees would often store honey in such fixtures, but to meet with much success under present conditions, the bee-keeper must use better methods.

"Prospects are very good everywhere where there has been plenty of rain for a splendid honey flow for next season. There is a great abundance of white clover and other honey-producing plants.

"We are often asked how to get ants out of bee hives. As they do but very little harm we do not bother about them much. If one can secure their nest where they may be located in anything removable from the hive, they can be taken off some distance from the hive and shaken off. If this is done close to the hive they will go back again. Treat roaches same way as the ants to get them out."

MARKET REPORT.

For Month ending 30th June, 1903.

Messrs. Dalgety & Company, Limited, report as follows in connection with their produce and grain sales, held at Perth and Fremantle during June:—

Chaff.—After the heavy rains of latter part of May, it was expected that supplies to the Metropolitan markets would show a considerable falling off. This, however, did not prove correct, and during the first half of June arrivals from the country came forward very freely, to the detriment of prices. During the latter portion of the month, however, supplies tailed off, and the market suddenly firmed, and prices ruled greatly in the favour of sellers. At the close of the month prices were as follow:—

Prime green wheaten	£7 15s. per ton
Prime wheaten	£7 5s. to £7 10s. per ton
Prime green oaten (very scarce)...	£7 12s. 6d. per ton
Good oaten	£6 15s. to £7 2s. 6d. per ton

in rising prices on the local markets.

We hereunder show a comparison of values:—

	During June, 1903.	
	First half of month.	Second half of month.
Prime green wheaten	£7 to £7 5s.	£7 10s. to £7 15s. per ton
Prime wheaten	£6 17s. 6d. to £7	£7 7s. 6d. ,,
Prime green oaten (very scarce)	None offered	£7 12s. 6d. ,,
Good oaten	£6 5s. to £6 10s.	£6 10s. to £7 ,,
Inferior oaten (badly cut)	£5	£6 ,,
Wheaten straw chaff	£5	£4 15s. ,,
Oaten straw chaff	£5	£4 7s. 6d. ,,
Barley straw chaff	£5	None offered.

During June we sold 125 trucks by auction at Perth and Fremantle, and we also sold privately, at current rates, 420 tons prime, 60 tons medium, and 50 tons of inferior chaff.

Oats.—June has been a declining month for local Algerians, the recent fall in values in the Eastern States having been keenly felt here, and, moreover, seed inquiries have subsided. We sold 1,500 bags of local oats by auction and privately, at the following prices:—Prime Seed, 4s. to 4s. 3d.; Feed Oats, according to quality, from 3s. 3½d. to 3s. 11d. per bushel. Unless Algerians are entirely clean and free from other grains, they are worth considerably less than New Zealand Oats.

Barley is in good demand, but very little offering. No Cape offering. "Chevalier" English, nominal value, 5s. 3d. per bushel.

Hay.—Now that stock shippers are filled, the demand will ease, of course to the disadvantage of settlers, nominal value £7 10s. per ton (wheaten and oaten). Prime Oaten Hay, suitable for racehorse feed, £8 per ton.

Wheat.—Farmers would do well to refrain from sending Prime Wheat to the City markets for the present, owing to heavy supplies of Californian wheat on the market.

W.A. Milling Wheat, nominal value, 5s. 9d. per bushel, F. and R., Fremantle.

Blue Stem (Californian Wheat), 5s. 9d. per bushel.

Sheepskins.—The market during the past month has been very firm, with an upward tendency for all crossbreds. Sheep off the shears are now beginning to arrive in fair quantities, and there is a keen inquiry for the pelts. We quote:

Best full-woolled merino...	7d. to 7½d. per lb.	
Medium merino	6¼d. to 6¾d. ,,	Damaged lines are from 0¾d. to 1½d. per lb. below quotations.
Inferior ,,	5¼d. to 6d. ,,	
Pelts ,,	4d. to 4½d. ,,	
Fine crossbred	7d. to 7⅜d. ,,	
Medium ,,	5¾d. to 6¾d. ,,	
Coarse ,,	4¾d. to 5¼d. ,,	
Pelts ,,	4d. to 4¼d. ,,	

Hides.—This market has been unsettled, but as supplies have been barely up to local requirements, the fall noticeable in other markets has not been so pronounced here.

Prime stout and heavy	None offering
Medium heavy	5d. to 5½d. per lb.
Prime light	4¾d. to 5d. ,,
Medium ,, ...	4¼d. to 4¾d. ,,
Extra ,, ...	4d. to 4½d. ,,

Damaged lots rule 1½d. per lb. below these prices.

Tallow.—This market, in sympathy with those of the other States, has fallen from 2s. to 3s. per cwt. We quote :—

Prime mixed	28s. to 29s. per cwt. (nominal).
Medium ,, ...	26s. to 27s. 6d. per cwt.
Inferior ,, ...	22s. to 24s. ,,

Kangaroo and Furred Skins.—Supplies are rapidly increasing, and the quality improving. All skins forward have met with eager inquiry, and ready sale at gradually increasing prices.

Kangaroo skins—

Grey, fresh, and light,	½lb. skins ...	1s. 6d. to 1s. 8d. per lb.
,, ,, ,,	¾lb. to 1½lb. skins	2s. to 2s. 4d. per lb.
,, ,, ,,	2lb. skins ...	1s. 7d. to 1s. 10d. per lb.
Red ,, ,,	½lb. skins ...	1s. 2d. to 1s. 5d. per lb.
,, ,, ,,	¾lb. to 1½lb. skins	1s. 9d. to 2s. per lb.
,, ,, ,,	2lb. skins ...	1s. 4d. to 1s. 8d. per lb.

Perished, shot marked, and blood stained skins from 1s. to 1s. 6d. per lb.

Opossum skins—

Ordinary greys and reds	7s. 6d. to 8s. 6d. per doz. (average)
Super ,, ,, ...	12s. to 14s. per doz.
1st blacks	26s. to 30s. ,,
2nd ,, ...	12s. to 16s. ,,

GARDEN NOTES FOR AUGUST.

By Percy G. Wicken.

The gardens throughout the State are fast putting on their best appearance, and the ground being thoroughly moistened, the growth of vegetables during the next few months will be rapid ; although in the South-West districts August is often a cold, wet month ; in other parts of the State the worst of the winter weather is over. Directly the heaviest of the rainfall is over, a start should be made to prepare the land for spring sowing, so that the crops can be sown as early as possible, and get a good start before the weather becomes hot. The month should be a busy one in the garden. Early vegetables and also fruit are generally very profitable to the grower ; a good reward will often be obtained by those who are able to give the care and attention necessary to raise early produce. Tomatoes are much in demand, and good money is to be made by those who can place early tomatoes on the market. In the

Northern districts tomatoes can be raised almost all the year round. No doubt many of our gardeners have plants already planted out; those who have not should plant seed in beds or boxes in well-sheltered positions, where they can be sheltered at night, and the plants will then be ready to plant out as soon as there is no danger from frost. Onions are another crop which should be largely planted out this month. When sowing vegetables, as well as farm crops, it should be remembered that a rotation of crops is necessary; the same vegetables should never be sown in the same ground for two seasons following, but plants of a different species should be planted; this helps to keep up the fertility of the soil, and also, to a considerable extent, helps to keep insect pests in check.

ASPARAGUS.—If the land has been prepared as described in previous issues, the roots should be planted out as soon as possible. In planting out, a hole should be dug in the trench already prepared, of sufficient size to allow the roots to be well spread out and about six inches deep; a ridge should be left in the centre of this hole, so that the centre of the plant is higher than the roots; fill in with fine soil and press firmly down, taking care not to injure the roots. The crown of the plant should be about two inches below the surface when covered up. The plants should be from two and a-half to three feet apart.

ARTICHOKES (JERUSALEM).—This plant, which belongs to the same tribe as the sunflower, is a very useful plant, and well worth growing. They are very palatable as a vegetable and also useful for feeding pigs. They are planted the same as potatoes, in rows three feet apart and 18 inches apart in the rows; they are very hardy, and will grow in almost any kind of soil.

BEANS (FRENCH OR KIDNEY).—There is always a demand for this vegetable; they may be sown in the warmer localities where there is no danger of frosts.

BEET (RED).—Sow in drills about 18 inches apart, and when plants come up thin out to one plant about every nine inches. Ground that has been previously manured for the last crop will be suitable for this plant.

BEET (SILVER).—This plant is best sown in a seed bed and transplanted. The leaves are used as a vegetable, and it will stand a very considerable amount of dry weather.

CABBAGE AND CAULIFLOWER.—Any plants of this tribe which may be in the seed beds should be planted out and a fresh supply of seed may be planted in order to keep up a succession.

CARROT.—Sow in land that has been well cleaned of weeds and do not apply fresh manure to this crop. It should be sown in drills about three feet apart, but two rows of carrots may be sown in each drill.

CELERY.—Sow a little seed, and if any plants are ready plant out in shallow trenches, into which abundance of manure has been dug. When the plants are well grown they should be earthed up for blanching before being used for table.

Cucumber and Melons.—Sow a little seed under glass or in a hot bed, and cover at night, and towards the end of the month in the open, when there is no danger of frost.

Onions.—Sow largely of this plant, either in drills or plant out plants from the seed bed. The surface soil should be worked up as finely as possible and liberally manured. The young seedlings require to be kept free from weeds.

Peas should be sown extensively on well-manured land. Plant in rows, from two to three feet apart, according to the variety, and stake the rows as soon as the plants are about 12 inches high.

Potatoes.—Plant out Early Rose or other early varieties as soon as all danger from frost is past. Always obtain clean, healthy seed, and never use tubers affected with scab for seed purposes. Two to three eyes should be left on each tuber, and they should be planted in rows three feet apart and about 15 inches apart in the rows.

Sweet Potatoes.—Make a seed bed and place tubers in same until they shoot; the shoots can then be broken off and planted out in the field. The shoots should be planted out in ridges three feet apart and 1½ft. apart in the ridges.

Tomatoes.—In well-protected places in the warmer localities, the young plants can be planted in the open, and in the cooler parts a supply of seed can be sown in seed boxes for planting out at a future date.

Farm.—The wheat crop should now be well forward, especially the early-sown crops. If the growth is not too rank, the crop may be harrowed and rolled; this will improve the growth of the crop and leave the ground ready for harvesting. This harrowing and rolling should not be performed if the ground is at all wet or likely to cake. In most districts potatoes can be sown during this month. Mangolds and sugar beets to provide food for the stock should both be sown as early in the month as possible. Mangolds are a gross feeding plant, and require a liberal supply of manure and a deeply-worked soil. Hungarian millet is a crop that can be sown during this month, and will produce a good supply of green feed very quickly; it is a quick-growing crop and can be used either as a green feed or made into hay and chaff for feeding sheep. Lucerne can still be sown on moist land, but the ground requires to be well worked and to be free from weeds. Buckwheat can also be sown this month, and is very valuable for bees, as the plants keep in flower for a considerable time. *Paspalum Dilatatum* (or Golden Crown grass) plants and seeds should also be sown during this month.

THE CLIMATE OF WESTERN AUSTRALIA DURING JUNE, 1903.

The rain that set in on the West and South-West coast at the end of last month extended throughout the State South of the tropics, and during the month of June good rains were experienced; the fall being considerably above the average throughout the district between Onslow and Geraldton, and about the average or slightly above over the Goldfields and throughout the South-West and South. North of Onslow little fell, and "*nil*" in the Kimberley district.

The rain was particularly heavy on the 28th in the Geraldton district, over 4 inches being recorded at several places in the 24 hours.

The atmospheric pressure was above the average, particularly inland over the Goldfields.

The day temperatures were about normal, but the night were slightly above the average for previous years. Frosts were, however, experienced at many places inland.

The following table gives the mean and lowest on the surface of the ground during the month:—

Station.	Mean.	Lowest.	Date.
Cue	39·0	36·0	16 and 17
Coolgardie	41·5	31·1	15 and 16
Southern Cross	40·0	27·0	15 and 16
Walebing	40·3	25·0	16
York	41·0	30·0	16
Perth Observatory	46·1	34·8	24
Wandering	—	—	—
Katanning	37·0	26·0	16
Bridgetown	39·7	31·0	6 and 26
Karridale	45·0	34·0	26

The Climate of Western Australia during June, 1903.

	Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
						June, 1903.					*Average for previous Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:	Wyndham ...	30·024	30·002	30·155	29·914	86·4	65·2	75·8	91·0	60·0	87·9	67·9	96·0	54·0	*Nil*	4554
	Derby	30·016	29·979	30·145	29·905	86·9	56·4	71·6	92·0	48·5	85·3	60·8	96·0	48·0	*Nil*	2187
	Broome ...	30·058	30·005	30·185	29·948	85·5	58·2	71·8	92·2	51·5	82·1	60·4	96·9	48·4	*Nil*	1608
	Condon ...	30·056	30·048	30·165	29·933	82·1	51·0	66·6	85·0	47·0	77·3	53·3	94·0	38·8	28	125
	Cossack ...	30·065	30·060	30·199	29·922	79·0	57·4	68·2	86·7	51·5	76·5	57·3	93·0	44·9	74	966
	Onslow ...	30·070	30·038	30·220	29·940	78·0	57·0	67·5	87·0	50·0	77·0	55·1	86·8	38·5	316	563
	Carnarvon ...	30·072	30·060	30·276	29·843	74·7	56·7	65·7	84·1	47·0	72·6	52·3	84·0	38·2	501	805
	Hamelin Pool...	30·070	30·076	30·290	29·810	71·0	55·0	63·0	77·0	44·0	69·4	51·5	79·8	36·2	340	431
	Geraldton ...	30·085	30·079	30·370	29·740	71·0	55·0	63·0	78·0	44·0	69·0	52·4	79·2	35·0	859	970
INLAND:	Hall's Creek *	...	30·074	...	...	79·6	...	...	89·5	38·5	80·8	52·2	89·5	33·1	*Nil*	3127
	Marble Bar ...	...	...	...	...	86·8	54·1	70·4	90·0	49·0	...	...	...	...	30	655
	Nullagine * ...	30·080	30·086	30·269	29·884	78·1	48·3	63·2	86·0	38·0	74·4	48·5	89·8	32·7	11	662
	Peak Hill ...	30·135	30·116	30·360	29·880	69·0	50·0	59·5	78·0	42·0	65·5	47·4	75·5	37·5	193	448
	Wiluna ...	30·147	...	30·443	29·867	67·0	46·4	56·7	78·5	36·0	...	...	...	...	191	643
	Cue	30·140	30·114	30·430	29·790	69·0	47·0	58·0	78·0	41·0	65·1	46·8	78·0	34·0	123	318
	Yalgoo ...	30·116	30·100	30·393	29·762	66·6	49·6	58·1	72·3	36·7	64·8	45·9	79·9	32·9	265	356
	Lawlers ...	30·152	30·123	30·469	...	65·2	46·7	56·0	74·2	36·8	62·9	46·6	76·2	33·7	212	782
	Laverton ...	30·186	...	30·524	29·829	65·3	45·0	55·2	73·4	35·3	...	...	...	...	152	767
	Menzies ...	30·160	30·113	30·510	29·730	63·0	46·0	54·5	72·0	38·0	62·0	45·2	75·6	33·3	151	1080
	Kanowna ...	...	...	...	...	62·7	43·3	53·0	71·0	35·4	...	...	...	...	158	725
	Kalgoorlie ...	30·158	30·103	30·556	29·676	62·3	46·0	54·2	69·7	36·7	61·5	45·7	76·4	34·0	218	711
	Coolgardie ...	30·158	30·105	30·556	29·697	62·0	45·1	53·6	71·9	35·0	61·3	44·0	78·3	31·5	158	516
	Southern Cross	30·120	30·078	30·520	29·670	64·0	43·0	53·5	74·0	31·0	62·0	42·3	77·4	28·0	113	392
	Walebing ...	...	...	...	...	64·0	46·6	55·3	69·2	34·0	..	...	...	...	450	866
	Northam ...	...	...	...	...	64·2	42·4	53·3	72·5	32·0	...	...	...	...	296	542
	York	30·120	30·080	30·540	29·670	64·0	41·0	54·0	69·0	32·0	63·2	42·5	76·0	30·4	276	457
	Guildford ...	...	...	...	...	65·7	46·2	56·0	71·0	34·0	...	...	...	...	637	1047

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during June, 1903—*continued.*

Locality.	Barometer (corrected and reduced to sea level).				Shade Temperatures.									Rainfall.	
					June, 1903.					*Average for previous Years.					
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens ...	30·110	30·096	30·531	29·693	64·5	49·6	57·0	68·6	40·5	64·6	47·3	81·0	31·2	596	1009
Perth Observatory	30·111	30·066	30·536	29·693	64·8	50·2	57·5	70·1	42·3	63·2	43·9	73·2	36·9	623	959
Fremantle ...	30·108	30·052	30·529	29·692	65·3	53·7	59·5	68·8	45·5	63·7	51·6	73·0	40·0	443	971
Rottnest ...	30·081	30·038	30·501	29·673	64·3	55·5	59·9	67·4	50·2	63·1	54·0	71·0	42·4	501	994
Mandurah ...	...	...	...	...	65·3	47·5	56·4	73·0	38·0	...	...	...	...	738	1202
Wandering ...	...	...	...	...	61·3	39·5	50·4	65·0	28·4	...	...	...	...	460	878
Collie	...	...	...	...	61·7	39·3	50·5	65·5	29·4	...	...	...	...	785	1254
Donnybrook ...	...	...	...	...	63·1	44·2	53·6	66·3	31·0	...	...	...	...	801	1230
Bunbury ...	30·085	30·050	30·480	29·630	64·0	50·0	57·0	69·0	38·0	63·8	47·8	73·7	35·2	967	1550
Busselton ...	...	...	...	...	63·8	47·4	55·6	67·0	36·0	...	...	...	...	581	1092
Bridgetown ...	...	...	...	...	62·4	41·1	51·8	66·0	32·0	...	...	...	...	516	1053
Karridale ...	30·060	30·024	30·450	29·540	63·0	49·0	56·0	68·0	35·0	62·2	47·6	76·0	31·8	601	1507
Cape Leeuwin ...	30·030	29·974	30·474	29·550	63·0	54·0	58·5	69·0	47·0	62·2	53·3	70·2	46·4	472	1004
Katanning ...	30·106	30·048	30·519	29·632	60·0	43·0	51·5	65·0	31·0	59·0	42·2	70·5	29·5	404	847
Albany	30·109	29·998	30·494	29·511	62·4	45·3	53·8	66·0	36·8	61·4	46·1	73·5	35·4	431	1363
Breaksea... ...	30·060	30·006	30·490	29·330	61·0	52·0	56·5	67·0	45·0	60·1	50·8	72·4	41·0	308	993
Esperance ...	30·085	30·038	30·490	29·500	64·0	48·0	56·0	73·0	38·0	63·2	47·8	77·0	35·5	285	773
Balladonia ...	30·152	...	30·518	29·628	62·3	43·4	52·8	73·1	32·7	...	...	...	...	92	466
Eyre*	30·132	30·088	30·544	29·656	61·4	47·2	54·3	77·4	31·7	64·6	46·2	78·6	31·1	126	672
INTER-STATE.															
Perth	30·111	30·066	30·536	29·693	64·8	50·2	57·5	70·1	42·3	63·2	48·9	73·2	36·9	623	959
Adelaide	...	30·124	...	...	...	...	...	...	...	60·3	46·7	76·0	32·5	...	...
Melbourne	30·076	29·995	30·610	29·655	54·6	42·8	48·7	60·1	33·1	56·9	43·9	68·1	28·0	335	...
Sydney	30·150	30·089	30·660	29·740	60·0	48·0	54·0	64·0	38·0	60·5	48·3	74·7	38·1	174	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
8th July, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for May, 1903 (completed as far as possible), and for June, 1903 (principally from Telegraphic Reports).

STATIONS.	MAY.		JUNE.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EAST KIMBERLEY:				
Wyndham ...	2	1	Nil	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	...	...
Plympton,St. Mary	...	....	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	Nil	...	...	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	Nil	...	...	...
Denison Downs...	...	...	...	...
WEST KIMBERLEY:				
Obagama ...	Nil	...	...	...
Beagle Bay ...	...	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	...	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	1	1	Nil	...
Fitzroy (C. Blythe)	Nil	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	5	1	...	...
Thangoo	...	...	...	...
La Grange Bay...	4	2	Nil	...
NORTH-WEST:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	28	1
DeGrey River ...	Nil	...	...	...
Port Hedland ...	11	1	26	3
Boodarie ...	...	...	17	1
Yule River ...	...	...	...	...
Warralong ...	5	1	...	...
Muccan	Nil	...	...	...
Ettrick	...	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	Nil	...	...	...
Pilbarra	4	1	181	4
NORTH-WEST—*cont.*				
Coongon	...	...	...	...
Warrawagine ...	200	3	...	...
Bamboo Creek ...	35	1	...	...
Marble Bar ...	3	1	30	3
Warrawoona ...	20	1	31	2
Corunna Downs...	14	1	...	...
Nullagine ...	110	3	11	2
Yandicoogina ...	...	..	..	...
Kerdiadary ...	Nil	...	...	...
Roy Hill	123	2	...	...
Mosquito Creek	100	2	..	...
Mulga Downs ...	Nil	...	...	...
Woodstock ...	Nil	...	...	...
Mt. Florence ...	Nil	...	...	...
Tambrey ...	Nil	...	...	...
Millstream ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Mallina	60	1	...	...
Whim Creek ...	Nil	...	98	1
Cooyapooya ...	Nil	...	...	...
Woodbrooke ...	Nil	...	...	...
Croydon	Nil	...	...	...
Balla Balla ...	Nil	...	60	3
Roebourne ...	Nil	...	25	2
Cossack	Nil	...	74	...
Fortescue ...	Nil	...	64	4
Mardie	Nil	...	...	...
Mt. Stewart ...	Nil	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	Nil	...	...	..
Onslow	Nil	...	316	4
Peedamullah ...	45	1	319	5
Red Hill	Nil	...	...	...
Mt. Mortimer ...	121	3	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	12	1	180	6
Point Cloates ...	40	2	...	...
GASCOYNE:				
Winning Poo ...	42	3	529	6
Towara	25	2	...	..
Ullawarra ...	18	1	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	7	1	...	...

RAINFALL—*continued.*

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Mt. Augustus ...	22	3	...	...
Minnie Creek ...	50	1	...	...
Yanyeareddy ...	42	1	...	...
Williambury ...	21	2	...	...
Wandagee ...	...	...	...	...
Bernier Island ...	120	3	...	...
Boolathana ...	16	3	491	9
Carnarvon ...	246	3	501	10
Cooralya	...	...	...	...
Doorawarrah ...	59	2	...	...
Mungarra ...	45	1	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	30	1	...	...
Upper Clifton Downs	21	3	...	...
Errivilla	...	...	323	4
Dirk Hartog Island	26	2	...	...
Sharks Bay ...	52	2	638	...
Kararang ...	...	...	...	...
Meedo	...	...	...	...
Tamala	...	...	...	...
Wooramel ...	106	2	430	9
Hamelin Pool ...	32	3	340	8
Byro	83	2	176	5
Yarra Yarra ...	60	3	236	4
Berringarra ...	60	3	236	4
Mt. Gould ...	56	3	...	...
Moorarie ...	58	4	244	4
Wandary... ...	70	4	213	4
Peak Hill ...	75	5	193	3
Horseshoe ...	87	6	220	3
Abbotts	75	3	41	5
Belele	73	2	110	3
Mileura	53	4	191	5
Milly Milly ...	37	3	...	...
Manfred ...	37	3	140	6
New Forest ...	17	1	320	9
Woogorong ...	6	1	...	...
Twin Peaks ...	...	...	220	7
Billabalong ...	Nil	...	257	5
Wooleane ...	Nil	...	40	6
Murgoo	28	3	263	5
Meeka	54	3	204	7
Mt. Wittenoom ...	37	3	214	7
Nannine	46	3	172	3
Star of the East...	51	3	184	3
Annean	178	3	...	...
Tuckanarra ...	58	4	172	8

Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Coodardy ...	...	...	...	...
Cue	129	5	123	7
Day Dawn ...	147	4	84	5
Lake Austin ...	194	3	197	6
Lennonville ...	57	4	203	8
Mt. Magnet ...	43	3	212	6
Warracoothara ...	136	3	...	...
Challa	92	3	199	8
Youeragabbie ...	45	3	236	6
Murrum	41	1	...	...
Burnerbinmah ...	59	2	...	...
Barnong	7	1	...	...
Yalgoo	15	2	265	9
Gabyon	11	1	283	7
Gullewa	5	1	359	8
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	1	1	...	...
Mt. View ...	Nil	...	...	...
Mumby	11	4	549	13
Northampton ...	3	1	520	11
Mt. Erin ...	52	2	...	...
Oakabella ...	34	4	...	...
Narra Tarra ...	60	3	...	...
Tibradden ...	28	5	54	14
Sand Springs ...	20	3	391	11
Mullewa... ...	5	1	399	13
Kockatea ...	3	1	421	12
Bootenal ...	3	1	...	...
Geraldton ...	34	6	859	16
Greenough ...	23	4	1010	9
Dongara ...	16	2	792	12
Dongara (Pearse)	22	3	770	13
Strawberry ...	79	2	479	9
Mingenew ...	24	5	529	14
Urella	42	3	346	12
Yandenooka ...	14	2	466	10
Rothesay ...	28	2	...	...
Field's Find ...	169	2	...	...
Carnamah ...	11	2	526	12
Watheroo ...	43	6	497	13
Dandaragan ...	29	4	453	14
Moora	66	3	399	13
Yatheroo ...	135	7	385	13
Walebing ...	66	6	450	17
New Norcia ...	62	3	369	14

RAINFALL—*continued.*

STATIONS.	MAY.		JUNE.	
	No. of points, 100 = 1in.	No. of wet days.	No. of points, 100 = 1in.	No. of wet days.
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	166	7	688	15
Belvoir	116	8	503	15
Mundaring ...	214	6	615	17
Guildford ...	121	9	637	19
Kalbyamba ...	180	5	...	...
Canning W't'r'w'ks	93	6	700	14
Perth Gardens ...	115	2	596	18
Perth Observatory	98	13	623	19
Subiaco	107	12	629	17
Claremont ...	143	9	...	...
Claremont (Richardson)	...	...	...	...
Fremantle ...	170	12	443	18
Rottnest... ...	163	11	501	16
Armadale ...	...	...	...	...
Rockingham ...	145	7	539	14
Canning River ...	226	8	...	...
Jarrahdale ...	122	8	735	15
Mandurah ...	148	10	738	16
Pinjarra	166	8	...	...
Yarloop	178	10	802	18
Harvey	167	7	829	18
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley ...	47	6	...	...
Momberkine ...	25	3	293	11
Monglin ...	28	6	309	13
Newcastle ...	73	6	463	12
Eumalga ...	98	8	501	16
Northam ...	68	4	296	14
Grass Valley ...	55	5	298	14
Meckering ...	35	7	288	14
Codg-Codgen ...	107	8	151	15
Jarragin... ...	80	7	...	...
Doongin... ...	65	7	178	10
Cuttenning ...	117	9	201	13
Whitehaven ...	77	10	255	13
Sunset Hills ...	46	5	...	...
Cobham	119	8	368	16
York	31	4	276	15
Beverley ...	69	4	208	15
Barrington ...	40	5	...	...
Stock Hill ...	54	2	294	12
Sunning Hill ...	96	5	...	...
Wandering ...	132	5	460	15
SOUTH-WEST—*contd.*				
Glen Ern ...	...	...	417	18
Pingelly ...	100	2	...	...
Woogenellup ...	79	7	371	14
Marradong ...	128	6	571	15
Bannister ...	133	7	...	...
Narrogin ...	65	3	397	14
Wickepin ...	60	5	...	...
Gillimaning ...	66	4	370	13
Bunking ...	56	1	...	...
Bullock Hills ...	78	3	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury ...	282	8	967	18
Collie	177	9	785	19
Glen Mervyn ...	197	7	835	19
Dardanup ...	227	5	817	15
Donnybrook ...	229	8	801	21
Boyanup ...	198	6	771	15
Ferndale ...	170	8	702	23
Busselton ...	260	8	581	20
Lower Blackwood	295	13	...	...
Karridale ...	320	10	601	25
Cape Leeuwin ...	182	10	472	25
Biddellia ...	317	10	...	...
The Warren ...	320	10	493	21
Lake Muir ...	159	12	343	19
Mordalup ...	133	8	309	19
Deeside	132	9	302	21
Riverside ...	149	9	305	21
Balbarup ...	188	8	380	16
Wilgarup ...	192	10	436	22
Mandalup ...	...	...	822	20
Bridgetown ...	181	6	516	25
Westbourne ...	165	12	...	...
Hilton	115	6	467	12
Greenbushes ...	284	6	548	7
Greenfields ...	136	6	583	16
Glenorchy ...	193	7	603	19
Williams ...	102	4	440	14
Arthur	39	2	577	13
Darkan	84	3	562	12
Wagin	83	2	571	13
Glencoe ...	74	3	513	15
Dyliabing ...	68	4	...	...
Katanning ...	92	5	404	14
Kojonup ...	172	6	666	16
Broomehill ...	102	5	365	9

RAINFALL—*continued.*

Stations.	May.		June.		Stations.	May.		June.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.		No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*					EASTERN—*contd.*				
Sunnyside ...	92	4	468	13	Bulong	274	10	134	8
Woodyarrup ...	86	4	548	14	Kanowna ...	367	...	158	...
Cranbrook ...	109	9	350	17	Kalgoorlie ...	290	5	218	7
Blackwattle ...	90	4	...	...	Coolgardie ...	193	7	158	8
Mt. Barker ...	165	10	362	18	Burbanks P.O. ...	196	7	138	7
Kendenup ...	100	8	395	20	Woolubar ...	196	8	175	7
St. Werburgh's...	133	11	...	...	Widgiemooltha...	129	11	121	8
Forest Hill ...	166	14	360	23	50-Mile Tank ...	128	9	78	5
Denmark ...	307	9	472	21	Waterdale ...	130	5	116	6
Grasmere ...	304	13	424	12	Norseman ...	77	6	40	4
Albany	261	12	308	24	Lake View ...	...	...	49	11
Point King ...	270	7	457	18	Bulla Bulling ...	62	6	...	...
Breaksea ...	200	13	472	25	Woolgangie ...	93	7	129	6
Wattle Hill ...	183	10	...	...	Boorabbin ...	128	9	215	10
Cape Riche ...	110	11	...	...	Karalee	140	4	216	8
Pallinup ...	87	6	483	12	Yellowdine ...	146	5	121	4
Bremer Bay ...	132	9	489	13	Southern Cross...	96	6	113	8
Jarramongup ...	72	6	...	...	Mt. Jackson ...	175	4	235	5
					Bodallin ...	95	3	109	6
EASTERN DIVISION:					Burracoppin ...	127	5	148	10
Lake Way ...	314	7	191	...	Kellerberrin ...	113	7	182	11
Gum Creek ...	185	4	...	...	Mangowine ...	90	8	...	...
Mt. Sir Samuel...	156	6	184	4	Wattoning ...	...	...	187	6
Lawlers	176	6	212	7					
Leinster G.M. ...	143	5	166	4	EUCLA DIVISION:				
Lake Darlot ...	118	5	142	3	Ravensthorpe ...	77	8	87	10
Mt. Leonora ...	215	4	223	3	Coconarup ...	49	9	123	11
Mt. Malcolm ...	222	4	209	4	Hopetoun ...	67	9	84	10
Mt. Morgans ...	197	4	170	4	Fanny's Cove ...	137	3	...	...
Burtville ...	176	4	119	2	Park Farm ...	131	10	188	18
Laverton ...	162	3	152	3	Esperance ...	122	10	285	20
Murrin Murrin...	264	5	229	4	Gibson's Soak ...	136	9	...	...
The Granites ..	250	4	190	4	30-Mile Condenser	146	9	...	...
Tampa	332	4	199	2	Swan Lagoon ...	103	11	...	...
Kookynie ...	266	4	201	4	Grass Patch ...	95	10	77	14
Niagara	396	5	169	5	Myrup	168	9	...	...
Yerilla	301	4	211	3	Lynburn ...	216	9	124	10
Edjudina ...	315	4	240	3	Point Malcolm ...	213	12	161	16
Menzies	339	6	151	7	Israelite Bay ...	243	11	75	9
Mulline	345	5	231	6	Frazer Range ...	149	8	...	...
Waverley ...	391	7	184	6	Balladonia ...	193	11	92	...
Goongarrie ...	337	5	132	7	Southern Hills ...	129	6	...	...
Mulwarrie ...	295	7	194	4	Eyre	181	12	126	14
Kurawa	378	8	180	7	Mundrabillia ...	...	...	...	...
Kurnalpi ...	380	5	122	5	Eucla	98	18	74	16

The Observatory, Perth,
8th July, 1903.

W. E. COOKE,
Government Astronomer.

Return of Fruit imported into Western Australia during June, 1903.

Name of Port.	Total No. of Cases.	No. of Cases Passed.	No. of Cases Prohibited.	No. of Cases Destroyed.	No. of Cases of														
					Apples.	Apricots.	Bananas.	Quinces.	Nectarines.	Lemons.	Peaches.	Oranges.	Passion Fruit.	Pears.	Plums.	Rhubarb.	Pomeloes.	Pines.	All other fruits.
Fremantle ...	9662½	...	...	...	5157	...	2418	46	...	346	5½	1256	120	167½	...	...	...	142	10
Albany	74	...	...	...	3	...	20	...	...	12	...	28	...	11	...	...	...	...	...
Geraldton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Esperance ...	29	...	...	...	16	...	1	...	...	3	...	9	...	...	...	...	...	...	...
Total ...	9765½	...	...	...	5176	...	2439	46	...	361	5½	1293	120	178½	...	...	...	142	10

Department of Agriculture,
8th July, 1903.

Return of Fruit Trees and Plants imported into Western Australia during June, 1903.

NAME OF PORT.	No. of Consignments of Trees or Plants.	Total No. of Trees or Plants in such Consignments.	No. of Consignments passed.	Total No. of Trees or Plants in such Consignments.	No. of Consignments of Trees or Plants prohibited.	Total No. of Trees or Plants in such Consignments.	No. of Packages dipped.	No. of Trees.															
								Ornamental and Pot Plants.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Vine Cuttings.	All other Trees.
FREMANTLE ...	...	38714	...	38714	...	...	...	3100	314	9994	2394	395	127	275	...	806	5528	7807	2910	3382	760	190	732
ALBANY ...	...	6427	...	6427	...	...	...	...	22	1969	177	51	60	72	...	35	97	428	49	249	2586	...	212
GERALDTON ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
ESPERANCE ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL ...	...	45131	...	45131	...	...	...	3100	336	11963	2571	446	187	347	...	841	5625	8235	3379	3631	3346	190	944

Department of Agriculture,
8th July, 1903.

By Authority: WM. ALFRED WATSON, Government Printer, Perth.

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NOTES.

STUD BULL.—The Acting Director desires it to be known that the Government stud Jersey bull will be available in September. Those who wish to have his services must make application to the Acting Director, Department of Agriculture, Perth.

DIRECTOR OF AGRICULTURE.—The Hon. the Minister for Lands has been pleased to appoint Mr. Alex. Crawford, late dairy expert, to the Department of Agriculture, and more recently Resident Land Agent at Geraldton, to the position of Acting Director of Agriculture, *vice* Mr. Wm. Paterson.

MANURIAL PROBLEMS.—We have received a copy of a pamphlet, issued by Weber, Lohmann, & Co., of Sydney, entitled "Manurial Problems in Australia." Its principal object is the advocacy of the use of potash in fertilising crops. A large number of illustrations are given which contain an object lesson that our farms would do well to learn.

LATE TOMATOES.—We have received a basket of fine tomatoes grown in the open by Messrs. Adams, at Koogie, Wanneroo. Considering that the fruit ripened after the frosts had set in, the possibilities of tomato growing in the districts should be encouraging. The fruit itself was large and firm, and as good specimens as one could wish to see. The seed was imported by the grower and named the "Superb."

WORMS IN YOUNG HORSES.—R.E.—Worms sometimes annoy foals exceedingly when they have attained the age of three or four months, or even earlier. An examination of the fæces will generally reveal the presence of these parasites, while the appearance of the young animals, their staring, harsh and unthrifty looking coat, longer than it should be, large pendulous belly, loss of flesh, with frequently a dry, husky cough, betray the effects of worms. The foals should have access to rock salt, and small doses of powdered sulphate of iron, given morning and evening, in a little mash. Ten to 15 grains of calomel given in mash, and repeated after an interval of 10 or 12 hours, is a very effectual remedy; from four to six ounces of linseed oil being administered six hours after the last dose.—*Live Stock Journal.*

THRUSH IN HORSES FROG.—A settler writing to the Stock Department for information as to the best treatment for the cure of "thrush" in a horse's frog, is informed by Mr. Weir, M.R.C.V.S., the Government Veterinary Surgeon, that:—"This diseased condition usually arises from horses standing in wet or manure for a lengthened period, and may be prevented or cured by observing perfect cleanliness. In the present instance all loose portions adhering to the frog should be removed by means of a sharp knife, and the frog itself made thoroughly clean. Drop about half a drachm of calomel into the space, spreading it all over the part, and plug the cleft up by means of a dressing of tow and Stockholm tar. This should be repeated in about four days, and continue until such time as a cure may be effected.

BLACK SCALE.—In the countries around the bay, and through a large part of Northern California generally, there is a marked decrease in the black scale, which was such a pest in that section a few years ago. Investigation in Napa, Santa Clara, Alameda, and other points show that the scale has been so reduced in the past year or two as to no longer rank as a pest in those places. At the Sherwood Hall property, in San Mateo country, there was, a few years ago, a large number of old olive trees that had been carefully cared for, but which, in spite of the best treatment, were still infested with the black scale, which resisted all attempts at its control, and finally, despairing of ever making the trees profitable, they were all cut down. In the same neighbourhood to-day are to be found many olive trees that were quite as bad as those destroyed, but no black scale is to be found on them. It is so with other plants on which this pest works. All through the sections named they are clean. Of course, scales can be found, for we cannot hope, even under the most favourable conditions, to extirpate a pest, but certainly in the northern counties the black scale has been reduced below the danger limit. That this disappearance is coincident with the distribution of the *Scutellista cyanea* in these sections would seem to give colour to the claim that is set up for this parasite that it is creditable with a good part of the work. Besides this, however, there is the native parasite, *Dilophogaster Californica*, and the *Rhizobius ventralis*, which, in some sections, have done splendid work, both working on the scale. It may be that the reinforcement of our native parasites by the new importation from South Africa has turned the tide against the scale. Whatever the cause, the fact remains that in the northern counties the black scale is not now the serious pest it was a few years ago.—*Weekly Chronicle.*

FRUIT FROM BRIDGETOWN.—The following clipping from a local paper is of a most interesting nature, and should convince many as to the great possibilities of that district.

"Through the courtesy of Mr. Sayers, the stationmaster, I am enabled to give your readers a few statistics relating to the quantity of fruit leaving the Bridgetown station during the present season. It should be borne in mind that this does not represent the total output for the Nelson District, as the Upper Blackwood is served by Hester siding. Large stocks of late apples, notably the Rokewood, are also being held back for enhanced prices:—

SEASON 1901-2.

Month.	No. of Cases.
December (1901) ...	158
January ...	1,494
February ...	1,488
March ...	2,109
April ...	2,240
May... ...	1,902
June ...	661
Total ...	10,052

Average weight per case, 43lbs.

SEASON 1902-3.

December (1902) ...	111
January ...	1,350
February ...	1,373
March ...	1,542
April ...	2,390
May... ...	1,686
June ...	784
Total ...	9,236

Average weight per case, 53lbs.
Total gross weight consigned, 1901-2—192 tons 19cwt. 1qr.
Total gross weight consigned, 1902-3—214 tons 8cwt. 0qrs. 16lbs.

It will thus be seen that although the present season shows a decrease in the number of cases consigned, amounting to 816, the total tonnage exceeds that of last season by 21 tons, 8cwt. 3qrs. 16lbs."

AGRICULTURAL LECTURES.

By Percy G. Wicken.

THIRTIETH LECTURE.

DAIRY CATTLE.

Ayrshire cattle came from the county of Ayrshire, in the S.W. of Scotland; previous to 1750 they were very much smaller than at the present day. About 1780 a much better system of farming was adopted, and more attention was devoted to the raising of cattle. Professor Wallace, of the University of Edinburgh, says the Ayrshire has an infusion of shorthorn blood (on account of the white nose) and also of Jersey blood. Sir James Graham was a great improver of this breed in Victoria. The Department of Agriculture of this State imported several cows and bulls of this breed two years ago; these have been distributed about the country, and some were sold to the Hon. H. J. Saunders at Henley Park, and some of the others are at the Narrogin Experimental Farm. The Ayrshire is a better cheese cow than a butter cow, on account of the small size of the milk globules. Ayrshires often average 1,000 gallons (or 10,000lbs.) of milk per annum, but from 600 to 700 gallons is the average of the herd. One gallon of milk is equal to about 10lbs. in weight.

These cattle used to be poor and undersized, and the first improvement of the breed was made by the Earl of Marchmont about 1724 to 1740, and from that time the herd rapidly came to the front.

They were first imported into U.S.A. in 1831, and were at that time a different animal to the Ayrshire of the present day.

The udder of a milk cow should be capacious and not fleshy; the hind part broad and well rounded, and should be firmly attached to the body; the bottom part nearly level, and extending well forward; the milk veins well developed; the teats 2in. to 2½in. in length, equal in thickness, and hanging perpendicularly, and the teats should be well apart. The Ayrshire cow has, as a rule, rather small teats, and this is a disadvantage in milking. The colour is red, of any shade, brown, or white, or a mixture of these, but each colour to be distinctly defined; brindles are not admitted, and dark brown is not in favour.

Channel Island Cattle.

In former years all cattle from the Channel Islands were called Alderneys, but there are none of this breed existing now, and the cattle from these islands are now all called Jerseys or Guernseys. The small island of Jersey supports 15,000 head of cattle and exports 2,000 head annually.

ALDERNEY is a name well-known to cattle buyers, but Jersey or Guernsey are often called Alderneys, although Channel Island cattle is the more correct term. It is contended that they were originally Norman cattle, as cattle very similar are found in many parts of Normandy. Colonel De Couters was a great improver of Channel Island cattle; he was secretary to the meeting in 1833 that led to the establishment of the Jersey Agricultural Society, and continued in office many years. The aim of this society was to improve the breed by careful selection, and a splendid race of cattle has been established. The export of cattle has been for many years one of the main industries of Jersey.

In 1871 there was a final separation between the Jersey and Guernsey breeds. The Jersey is the smaller animal of the two, finer in its limbs, neater in its frame, more thoroughbred in appearance; the horns are finer and more crumpled; the face thin and more concave, more docile and intelligent in appearance; the eye is a bright black, often with a white rim, and the muzzle intensely black with a light coloured rim. Colour: any mixture of fawn, silver grey, brown, dun, cream, and rarer specimens of black and white; these colours often converge one into the other.

GUERNSEYS.—Professor Wallace says this is a larger, stronger boned, and coarser animal to look at than the Jersey; its outlines are not so fine or symmetrical, but it will take on beef better. Guernsey colours are more broken than the Jersey and the muzzle is flesh-coloured.

Some extraordinary milk yields have been obtained from these cattle; as much as 1,000lbs. of butter per annum having been obtained from some of the champion cows of this breed.

The points of a milch cow of any breed are:—A bright eye; horns thin; neck fine and deep and thickening towards the shoulder; brisket fine; ribs well spread, giving round form to the carcass; well formed across hips and on rump; standing medium height on her legs; tail thick at upper part but tapering to a fine point; hide should be mellow; hair soft; milk veins large; udder of sufficient size to contain a good supply of milk but not fleshy; skin of udder thin; teats of moderate size, equal distance from each other, and should be same size at top as bottom.

The following short rhyme illustrates the requirements for a good dairy cow:—

DESCRIPTION OF A GOOD MILCH COW.

(Extracted from *Farmer's Magazine.*)

She's long in the face; she's fine in her horn;
She'll quickly get fat without cake or corn;
She's clean in her jaws, and full in her chin;
She's heavy in flank, and wide in her loin;
She's broad in her ribs, and long in her rump;
A straight and flat back without even a bump;
She's wide in her hips, and calm in her eyes;
She's fine in her shoulders and thin in her thighs;
She's light in her neck, and small in her tail;
She's wide in the breast, and good at the pail;
She's fine in the bone, and silky of skin;
She's a grazier without, and a butcher within.

HOLSTEIN OR FREISAN OR DUTCH CATTLE.—This breed has of late years become celebrated for their milk-producing qualities, combined with their great beef production. They may be called a general purpose cow. They are the native cattle of Holland, and their pedigrees can be traced back for a great number of years. They are generally black and white in colour, with a few occasionally red and white. They are very symmetrical, with a great development of the milk-producing organs. The peculiar characteristics of the pure type of these cattle are the horns, they may be ranked among the shorthorns; the horns advance horizontally and then upwards. Hollanders judge the milking properties by the horns; a short horn is a sign of good milking and degree of fineness; although they give an abundant supply of milk it does not prevent them putting on fat, they are very vigorous and said to retain their powers under adverse conditions. They are, however, a breed that is bred on rich soil in the lowlands of Holland, and are used to liberal supplies of rich herbage and require a similar rich soil to give their best results. The leading characteristics are :—

They are large in carcase; well proportioned; broad across the loins; chime full; legs short; head small and handsome; neck deep and sloping well towards the shoulder; hide medium thickness; excellent touch; flesh thick and close grained, retaining the juices well, and highly valued for shipping purposes. Some extraordinary yields are also reported from the herd book of this breed. A heifer named "Morecedus," in a seven days test, gave 21lb. 8ozs. of unsalted butter. A cow, "Old Aggie," was the first to astonish the world with a record of 18,004lb. of milk in a year, and was beaten by her daughter, who gave 20,765lbs. in a year, and 26lbs. 7ozs. of butter in a week. Holland exports an enormous quantity of butter and cheese, nearly all made from this breed of cattle.

The herd book was started in 1839.

This is one of the oldest breeds of cattle, and is very much in favour in U.S.A., where it was introduced in 1625, and from that time has been constantly bred in the States. In the early part of the last century large numbers were imported into America from Holland; the breed has been considerably improved.

ILLAWARRA BREED OF SHORTHORNS.—These are of the milking strain, and may be said to be the only Australian breed of cattle. Mr. D. L. Dymock, one of the greatest authorities on this breed, which has its home on the South coast of New South Wales, in a district of which the Shoalhaven River may be taken for a centre, and is greatly noted for its dairy products, says that the herd was started by a Mr. De Mestre, one of the oldest settlers in that district, who used to purchase every ship's cow that came to Port Jackson that he could get hold of. The breed is a blend of all cattle, regard only being had to their milking qualities; they comprise Ayrshires, Shorthorns, Jerseys, and Holsteins.

Mr. Dymock says the cattle are grades of nearly all breeds, the breeding of which is due to knowledge based upon production; it is a breed entirely of their own. Holstein bulls have been used to improve the herd, as well as shorthorns. The Kiama dairy herd book was established in 1883, and the conditions of entry are that cows of all breeds and all sizes are inserted so long as they produce 12lbs. of butter or 350lbs. of milk per week. The test is made by the association, under supervision, and a bull is admitted if four of his progeny fulfil this test. The colour is given as roan, red, or red and white preferred; all varieties of black, brindle, or pale, washy yellow objectionable. These points would prohibit Jersey or Holstein grades from obtaining a reward under this head.

Kerry Cattle are regarded as a kindred breed to West Highland cattle. They are undoubtedly an original race, and the only native breed existing in Ireland. There is also much in them which indicates a relationship to the Brittany cattle, and it is thought that there may have been an exchange between them in the early times, as Kerry is the nearest point in Ireland to Brittany. The Kerry cow is a light, neat-made animal; fine and rather long limbs, fine small head, lively eye, fine white horns, rump rather narrow. The most fashionable colour pure black, some black and white. They fatten rapidly, and produce flesh fine in the grain and well flavoured, but it is as a dairy cow that she is so much esteemed. Although active and nimble, they are very gentle; they are the pets of the family. They give from 16 to 18 gallons of milk per week, and the percentage of cream is very high; they are a good poor man's cow. Mr. J. Robinson, of La Marcha, County Dublin, has done much to improve this breed of cattle. They should measure about 38 inches in height and 70 in girth, and when fat weigh about 6cwt.

The Dexter is a smaller animal again than the Kerry, and very similar in appearance. They are very hardy, and said to never suffer from any disease.

THIRTY-FIRST LECTURE.

Welsh Cattle.—There are several varieties of cattle in Wales. They are similar to each other, and have been bred there for centuries. The Pembroke and Anglesea are the two principal breeds, and each breed has a herd book of its own. The leading points of a Pembroke cow are—Colour: Black, some with white markings on the belly and brush of the tail; a chocolate colour is also considered good. The horns are long, yellow, and black tipped, and exceedingly sharp at the points. Wonderfully hardy in constitution. Long shaggy coats of hair; resembles the Kerry cow to some extent. They do not fatten at an early age, but when allowed to come to maturity they make good beef. As milkers they have few rivals. They give milk of the richest description, and are somewhat largely purchased for the U.S.A.

The ANGLESEA breed resemble the Pembroke, but are smaller and shorter in the legs, with heavier heads and thicker necks; heavier horns, much finer in the coat, thinner skin, and better handlers. They are better for beef, but not such good milkers.

BRITTANY CATTLE have found their way into nearly all parts of the world. Their characteristics are somewhat similar to the Jersey, except that they are much smaller in size; they are not noted for the quantity of milk they give, but for the percentage of butter fat which it contains, Cows of this breed have been known to yield 4lbs. of butter per day.

Colour.—Black and white, a few white and black, and sometimes a pure white. Characteristics: Average height, 36in.; she is a perfect dairy cow in miniature, a very symmetrical form, a fine clean head, sharp outline, small muzzle, bright eyes, small ear, a slender horn, and thin wedge-shaped neck and straight back, prominent and well-developed hindquarters, ribbs well arched, chest wide and deep, limbs remarkably beautiful, skin fine, soft, and very mellow in colour, hair fine and curley. A poor man's cow, and the pet of the peasants. It is exceedingly docile, and satisfied with little feed.

SHETLAND CATTLE.—Almost the same as Shetland ponies—rugged, rough, and small, fair beefers and fair milkers. Colours are various, usually a broken light colour, horns short and insignificant. They are exceedingly hardy.

THE TEETH OF AN OX.—The calf is born with two small milk teeth, and they generally get two teeth every week until they get eight teeth, and they retain these until they cut their permanent teeth. A full-grown bullock has 32 teeth, eight incisors or cutting teeth (lower jaw only) and six molars or grinders above and below in each jaw; they have no tusks. The milk teeth remain from 18 months to two years, and at this period the animal has difficulty in eating grass, and will do better if fed; he is then teething. They then grow two teeth every year, making him five years old for full-mouth; the steer at this age becomes a bullock, and the heifer a cow. He has good teeth until ten years old, when they begin to open out and wear down. A horse can eat grass very short, as he can bite it with his teeth, but a bullock, having no teeth in his upper jaw, requires the grass to be longer, so his tongue can gather it, which Nature has made rough for this purpose.

Hereditary Tendencies.—The characteristics of parents are transmitted to the offspring, like produces like; the tendency to lay on fat in certain breeds is hereditary, and the milking qualities of other breeds are also hereditary; therefore special care should be taken in the selection of the animals of either sex for stud purposes. They should both be true to the type of animal which it is desired to produce.

Breeding.—The offspring of immature animals are more disposed to attacks of disease from slight causes than that from mature animals, and they have not that robustness of constitution which is necessary in the animal to make stock raising a profitable occupation. The period of gestation in the cow is 40 weeks.

Rearing.—If first-class cattle are wanted, and to rear them well, there is no better system than nature's own, to allow them to suckle their mothers; but as in most cases the milk of the cow is required for human consumption, it is then necessary to feed the calf by hand, and for this purpose the separated milk mixed with linseed or some other cheaper ingredient to replace the cream is used. If the calf is to be reared by hand, it should be taken as soon as dropped and the cow not allowed to see it, although in most cases it is customary to leave it with the mother for the first few days. If this is done, when it is weaned it should be taken right away from the cow, so that they cannot hear or see one another. The milk for the first three or four days should always be given to the calf, and should on no account be used in the dairy. This milk is termed "beastings," or "colostrum," and is of quite different composition to ordinary milk, containing more casein. The analysis of ordinary milk and beastings is as follows:—

	Ordinary Milk.	Beastings.
Casein ...	4·48	15·1
Butter fat ...	3·13	2·6
Sugar of milk...	4·77	...
Saline matter...	0·60	2·0
Water ...	87·02	80·3

It is necessary to ensure health in the calf to give it abundance of beastings. Teaching the calf to drink milk is an unnatural process, as the head is down instead of up. Bring the head down to the bucket gradually with a finger in the calf's mouth, and keep the nostrils free. The calf will soon begin to suck, and after that no further trouble will be experienced. There are many patent devices for feeding the calves when they have to be raised by hand. A common way is to have a teat on the end of an indiarubber tube, which is placed in a bucket of milk or other food, the teat being inserted through a board. The calves are taught to go to this when they require food, and soon become accustomed to it. For the first week after birth the calf should be fed on the mother's milk; after that partly skimmed milk, and then skimmed or separated milk only. Although skim milk may keep the calf alive, it requires something added to keep the calf in condition and to force it into growth. Boiled linseed, pollard, or oilcake are some of the foods which may be used for this purpose; these are boiled and stirred into the skim milk. During the first three months a calf requires from 15lbs. to 20lbs. of skim milk per day, and should on that gain 1lb. live weight per day, but when linseed jelly is added it is estimated that they can be made to gain 2½lbs. per day. Whey is also considered an excellent food for calves. This consists of about 93 per cent. of water and 7 per cent. of solids. This also must be supplemented by the addition of some richer compounds. It is stated that a table spoonful of codliver oil in one gallon of whey makes a splendid fattening food for calves.

METHOD OF SHOWING PEDIGREE OF STUD STOCK.

Ayrshire Bull, *Hamilton*.

Colour, brown and white. Calved on 18th October' 1899. Four years old. Bred by Mr. John Grant, Seafield, Tullamarine, Victoria.

Sire—Bothwell (109 A.H.B.).
Dam—Plum of Seafield (767 A.H.B.), by Scotland (84 A.H.B.).
g. dam—Pansy 3rd (274 A.H.B.), by Duke of Randwick (imp.).
g.g. dam—Pansy, by The Miller (86 A.H.B.).
g.g.g. dam—Nora, by Colin.
g.g.g.g. dam—Lady Hamilton, by D. McLean's imported bull.
g.g.g.g.g. dam—Blanche (imported from Scotland).

Then give list of prizes won by the animal, sire, and dam.

METHOD OF DEHORNING CATTLE.—This is performed soon after the animal is born by rubbing the small nobs with caustic potash. Little quills about the size of a pencil are filled with caustic potash, and sufficient can be bought for a few pence to dehorn 20 calves. If these quills are not obtainable, small sticks of caustic potash can be obtained, but this must not be allowed to touch the hands. The operation should be performed when the calf is between three and 14 days old, just as soon as the horny nobs on the head make their appearance. First the hair should be cut round the nob with a pair of scissors, the horn is then moistened and the caustic potash applied; rub the horn well with the stick of potash, taking care that none of it gets on the flesh; continue the operation until the skin over the horn gets red and commences to peel off. It takes two to three minutes, and this prevents the horn from growing and causes very little pain. The caustic potash should be kept in a well-stoppered bottle to keep it dry. The operation of dehorning a full-grown animal has to be performed by sawing the horn off a few inches from the head. It is very painful and attended by considerable risk to the operator, it often being necessary to chloroform the animal. In some parts dehorning cattle is largely carried out, as it is said that the cattle do better, do not knock one another about, and can be trucked easier and arrive at their destination in better condition.

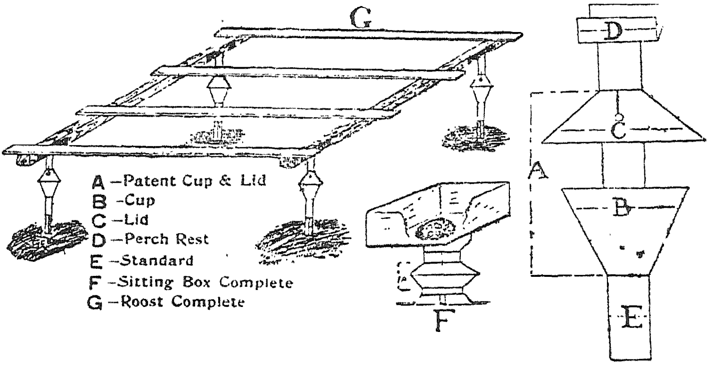
BRANDS.—The system of branding is one on which we must say a few words. This should not be done indiscriminately, as it deteriorates the value of the hides. A large brand should not be used; 2½ inches is large enough for any brand, and the brand should never be put on the ribs, but should be put on the neck or near the tail, so as to be on the edge of the hide when the animal is skinned; it can then be cut out, whereas when it is placed in the centre it spoils the whole hide, as it often causes the leather to break. A very good system is to put a brand and a number on the horns when the animal is two years old and it will remain visible for a long time.

POULTRY NOTES.

By Frank H. Robertson.

The Poultry Tick.

How to deal with the tick pest is a problem that many poultry-keepers in Western Australia have been at particular pains to solve, and I have much pleasure in introducing to my readers the following particulars of an exceedingly simple contrivance now on the market, patented and invented by Mr. A. P. McCormack of Coolgardie. The apparatus is cheap, easily handled, and, although I have not actually used the patent myself, I have seen it in operation, and I cannot see how it can fail as a means of preventing tick reaching the fowls, and also, if properly attended to, should be the means of entirely ridding the pest from the premises.



The accompanying cut will explain its working. First four pointed wooden posts, a little thicker than an ordinary broom handle are driven into the ground, and over the top of each post is dropped one of the patent shields, which are made of galvanised iron and hollow, but closed in on top, a few inches down is a cup, which is filled with water, to which is added a small quantity of kerosene; over the cup is a cover to prevent dirt getting into it. This cover slides up and down, but does not quite touch the rim of the cup. A framework of perches all on the one level is then dropped into the slot on top of each perch, and the affair is complete. Ticks crawling up the perches are thus prevented from reaching the fowls, and after repeated failures crawl up the woodwork of the post, and between it and the piping they find a snug retreat and remain there. All that is then necessary is, next morning, to lift off the shields, turn them upside down, and fill them with boiling water; the ticks are thus easily destroyed. Should, however, any ticks reach the fowls by dropping on to them from the roofs, or brought by the fowls themselves, a few crevices should be left in the perches for them to hide in; these should also be occasionally examined, and treated with scalding water. The cross perches, if not securely nailed but kept in position by dropping a large nail into a bored hole, are thus easily removed for examination and destruction of lice or tick that may be hiding underneath them. By use of the patent shields as above described, the adult fowls are kept clear of the tick. The question then arises: how can the chickens be saved, because they are sure to get tick-infected when being covered by the mother hens in the ground nest boxes at night time. Ticks only are in evidence in the dark, so chickens are quite safe in running about in the day time. To obviate this, the McCormack patent also provides a larger shield on to which is screwed the box for the hen and chickens to roost in at night time, and if one or two small boxes are placed close to, but not touching the raised nest, easy access is thus made for young chickens to reach their roosting-place and be in a safe retreat from the pest. At the same time the wood-work of the box should be occasionally scalded in case ticks should be there which have germinated from eggs conveyed by the hen or chickens.

The Government has on more than one occasion been requested to take steps to combat the ravages of the poultry tick, but the difficulty has always been to hit on some plan which would be effective; besides, the pest has now spread over such a large area that it would be a very expensive affair for the State to undertake its eradication; but if individual poultry-keepers would each do their best to stamp out the pest, its evil effects would be reduced to a minimum. The above described apparatus offers a simple means to all who are really anxious to do so.

The tick is now very numerous in Perth and suburbs, Fremantle, Cottesloe, etc., also York, Northam, Beverley, and very bad in the warm goldfields districts, such as Coolgardie, Kalgoorlie, Cue, Day Dawn, Lennonville, Mount Magnet. I cannot hear of it in the South-Western districts such as Bunbury, Busselton, Bridgetown, Greenbushes; neither can I hear of it on the Great Southern line between Beverley and Albany. It therefore behoves all poultry-keepers in districts now free of tick to exercise the greatest care in introducing fresh stock into their yards, to be sure that they do not bring the tick with them. Fowls may look the picture of health and have no ticks on them, yet if they come from infected yards they may bring the germs with them in the form of eggs, either attached to the feathers or in the boxes they come in. All cases should be immediately burned, and the fowls dipped in a solution of phenyle and water. The safest plan of course would be to buy no fresh poultry from outside districts, and if new blood is wanted, do it by means of bought eggs and hatch your own stock birds.

POULTRY ON THE FARM.

Whatever way one looks at poultry-keeping as a source of profit, we cannot but come to the conclusion that the general, all-round farmer is the person who can make the most money out of it and in the easiest manner. He has a great advantage over the poultry farmer pure and simple, who has to buy all the feed his fowls consume; whereas the farmer, who carries on the raising of crops of some kind, a few horses, cows, pigs, and in many instances fruit-growing, all of the above are his recognised sources of income. The fowls on such a place are little more than scavengers, consuming the refuse grain that would otherwise have gone entirely to waste; and when that is all consumed, and it is necessary to hand-feed the stock, who is there that can supply the feed at so cheap a rate as the man who grows it? And if the daily feeding of the fowls becomes a bore or liable to be neglected, the simplest plan would be to leave a bag of wheat in a shed to which the fowls have unrestricted access. They will soon pick holes in it, and have a feed of wheat whenever they feel inclined, and if previously accustomed to unlimited feed no ill effects will ensue, neither will they get too fat. The active life scratching and running all over the farmyard prevents this. I met a farmer lately who adopts this system. His fowls are never too fat and he gets a splendid egg supply. His average works out at 175 eggs per hen per annum, which is a very good one and much above the general average. The breed kept is the Golden Wyandotte, pure, also crossbred. The latter he finds as good an egg-producer as the pure. The fowls that get too fat from over-feeding are those kept entirely in small enclosed runs. Fowls so kept can be extra well fed, and at the same time prevented from getting too fat, but it requires a lot of work, time, and scheming to devise means whereby they may be kept in a state of constant activity. The favourite mode adopted by the Americans is to provide sheds heavily littered with refuse chaff, leaves, or straw, into which the grain is thrown, and the fowls are kept in good health and activity by the vigorous scratching, and scraping indulged in while hunting for the lost grain among the litter. The ordinary farmer who lets his fowls have free run has his birds in the best condition. They have unlimited feed and plenty of exercise. The great objection to this system is the nuisance of having fowls in the horse's feed-boxes, or by getting into the feed-room, etc. Well, to obviate this, it will certainly pay to enclose with high wire-netting small yards in front of the stable or other building which it is desirable to keep the fowls away from. Good gates with simple and quickly-acting latches should be used, and always kept closed against the fowls. This system would be found better and much cheaper than enclosing the fowls.

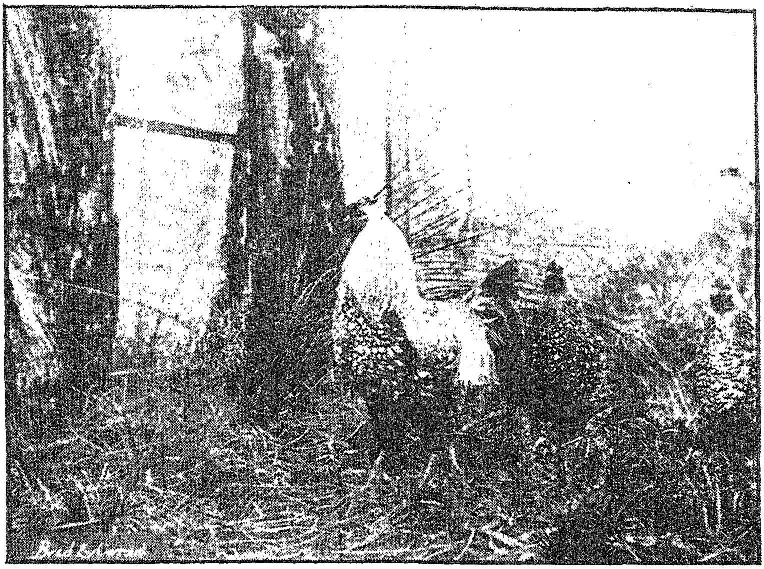
A Successful Poultry Farm.

The accompanying illustrations are from photographs of White Leghorns and Silver Wyandottes on the farm of Mr. G. Oneto, of Cannington, whose property is about a mile from the Cannington Railway Station. Mr. Oneto, who is a successful poultry-raiser, recently bought a camera, and has evidently mastered the art of making fowls keep still while "being took." Instead of using the usual hooded apparatus, which is almost enough to frighten human beings, he keeps the camera in an innocent-looking box about the size of a kerosene case, the sight of which the fowls have previously been accustomed to by keeping a dummy box of similar appearance in the yard.

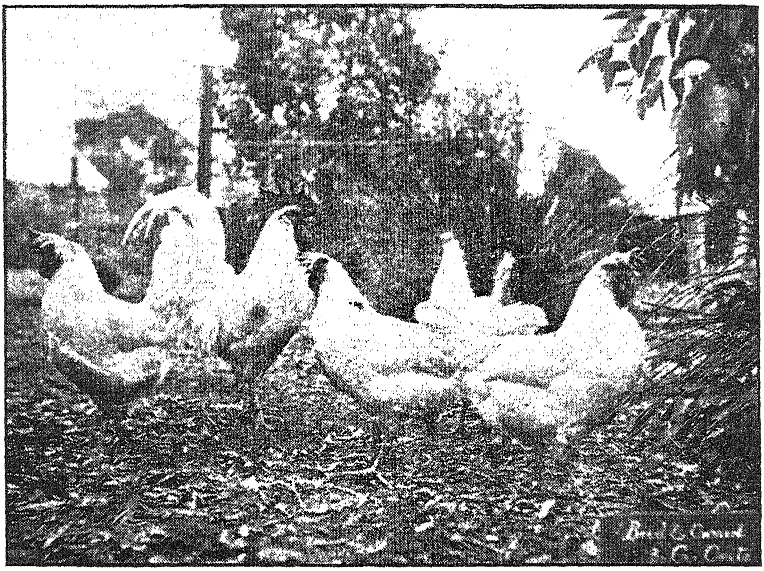
Mr. Oneto and his mate Bob are enthusiasts in poultry culture; they study their birds and make them pay well, and in a very simple and inexpensive manner, quite different to the ordinary run. They have no fowl houses, no incubators, divisions to runs only 4ft. high, with a single wire six inches above that, they do not show, nor advertise, don't sell eggs for setting, and don't lose any from sickness, yet they rear 400 to 500 pure-bred birds of first-class quality and make them pay well. The property consists of 15 acres, two acres of which is rich swamp land devoted to vegetables of many kinds, four acres are vacant and nine acres are used for fowl runs which surround the garden, and are left in their natural condition of tree and scrub; they are from quarter to half an acre in size, and as only a small number of fowls are kept in each run, the ground never gets tainted, and being so large the fowls have but little inclination to fly over the low boundary fences; they roost in the trees and lay their eggs in the scrub. The breeds kept are Silver Wyandottes, White Leghorns, and Minorcas. The chief sources of profit are eggs for the market, and birds for stock purposes. The choicest specimens fetch as high as four or five guineas, while many are sold at prices ranging from 10s. to £1 each, many of the culls are eaten, or sold as table poultry. The present output of eggs is about 40 dozen a week; the cost of feeding a stock of 550 head is about £3 per week. The average cost per fowl is estimated at 1¾d. per week, pollard at £10 per ton, and wheat 6s. 6d. per bushel. The fowls are fed at day-break with warm soft food, and wheat at night time. These are the staple foods; oats are occasionally given, and fresh cut raw bone is also used in the soft food. Very little soft food is given to chickens, chiefly oatmeal, but no hard-boiled eggs. A good supply of green stuff is, of course, given all the year round. Poultry run on these lines can be made to yield a handsome return, provided the owner has a good knowledge of his subject, and almost anyone, whether an expert or not, can, by starting on similar lines on a small scale at first, gradually increase his number of runs and stock as his knowledge correspondingly increases.

Diseased Fowls in Auction Rooms.

Poultry-keepers, farmers, and others are warned that the poultry for sale at the various auction rooms are now inspected by an officer of the Stock Department, and all diseased stock are condemned, and not allowed to be sold. Persons conveying poultry to the auction rooms should, therefore, be careful to thoroughly examine their birds to see that they are quite free of disease before sending them away. It is quite disgraceful the badly affected fowls that are to be seen for sale at the auction rooms, which are quite unfit for human consumption. Poultry-raisers should burn



Silver Wyandottes (bred by G. Oneto).



White Leghorns (bred by G. Oneto).

all stock that are allowed to get into such a condition, to bury them is not sufficient, as dogs and other animals are likely to root them up. All poultry-keepers should make themselves acquainted with the various diseases and also learn how to treat them. A pamphlet dealing with diseases is published by this Department, which will be forwarded on application free of charge; the poultry Expert is also willing to deliver lectures, with lantern views, in any locality requested, and personally inspect yards where practicable.

STATISTICAL.

By Percy G. Wicken.

The following particulars in regard to our productions and imports for the past year are now available, and, are tabled in a form which may prove of interest to our readers. The area and production of our principal crops for the year ending 28th February appear as follows:—

	Area.	Yield.	Average.
Wheat ...	... 92,052 acres	... 970,443 bushels	... 10·54 bushels
Maize ...	... 186 ,,	... 2,498 ,,	... 13·43 ,,
Oats ...	... 10,145 ,,	... 161,205 ,,	... 15·89 ,,
Barley ...	... 3,574 ,,	... 45,778 ,,	... 11·82 ,,
Hay ...	... 103,938 ,,	... 91,018 tons	... 0·88 tons
Potatoes	... 2,051 ,,	... 6,156 ,,	... 3·0 ,,

There is an increase in the area under oats, barley, hay, and potatoes over the area sown in the previous year, and a slight decrease in the area under wheat, although the average being higher, the total quantity of wheat produced during the year exceeded that of the previous year by 14,000 bushels.

The average yield of wheat in the Australian States for the past year is:—

Western Australia	10·54	bushels per acre.
South Australia	5·9	,,
Queensland	3·28	,,
Victoria	1·29	,,
New South Wales	1·2	,,

But due allowance must be made for the serious losses occasioned by the disastrous drought in the Eastern States.

Our imports still continue to keep up to a high level and show that for many years to come there is an ample local market for the settler before he will have to look for an outside market for his products. In the accompanying list, which shows the items from our imports which we ought to be able to produce within the State, I have shown the amount of duty which is collected on same, which is also to the advantage of the local settler.

IMPORTS, 1902.

Item.	Duty.	Quantity.	Value.
Wheat	1s. 6d. cental	86,089 bushels	£16,298
Flour	2s. 6d. „	12,336 tons	£116,831
Bran	1s. „	10,994 „	£61,731
Pollard	1s. „	2,616 „	£15,374
Oats	1s. 6d. „	638,912 bushels	£96,946
Barley	1s. 6d. „	61,780 „	£10,376
Maize	1s. 6d. „	5,140 „	£1,219
Peas	1s. 6d. „	6,553 „	£1,759
Hay	1s. cwt.	244 tons	£913
Chaff	1s. cwt.	695 „	£3,318
Potatoes	1s. cwt.	12,140 „	£62,555
Bacon	3d. per lb.	2,949,556 lbs.	£110,626
Ham	3d. per lb.	565,916 „	£23,888
Butter	3d. per lb.	5,730,149 „	£310,584
Cheese	3d. per lb.	1,156,859 „	£29,585
Milk (preserved)	1d. per lb.	4,379,818 „	£78,427
Eggs	6d. per doz.	1,471,293 doz.	£71,885
Fruit (green)	2s. cental	...	£23,812
Meat (fresh)	Free	1,316,305 lbs.	£21,514
Cattle for slaughter	Free	8,856 head	£102,640
Sheep for slaughter	Free	62,187 head	£75,519

The above list might be added to very considerably, by including such items as jams and preserves and numerous other items which will no doubt be produced here when the supply of produce is more equal to the demand. From the above list we can make the following notes:—

We produced 25,537 tons of wheat; we imported 28,211 tons of mill products.

We produced 161,205 bushels of oats; we imported 638,912 bushels, nearly four times as many as we produced.

We produced 45,778 bushels of barley; we imported 61,780 bushels.

The importations of chaff and hay are very small, and we are meeting the market for this article.

We produced 6,156 tons of potatoes, and imported 12,140 tons.

We imported, roughly, 3½ million pounds of bacon and ham, all of which might have been produced within the State.

Also butter to the weight of 5¾ million pounds, cheese over one millions pounds, condensed milk nearly 4½ million pounds, eggs 1½ million dozen.

For the butcher, we imported nearly 1½ million pounds of frozen meat, over 8,800 head of cattle, and 62,000 head of sheep for slaughter, to the value of about £200,000 sterling.

The cash value of the items mentioned totalling about 1¼ million pounds, all of which might have been produced within the

State, and this amount circulated among our own settlers, would of a necessity greatly improve the present conditions.

The demand for all these products increases daily, and is it any wonder that we are continually hearing of the increased demand for land in our agricultural districts where the land is good, the seasons regular, droughts sufficient to cause a failure of crops unknown, and a market for such quantities of produce as mentioned above to be supplied, before it becomes necessary to look for a market elsewhere.

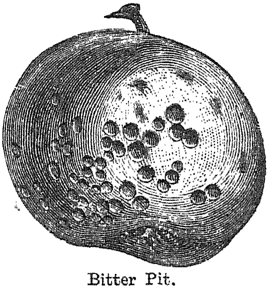
INSECT AND FUNGOID PESTS.

By A. Despeissis.

Continued.

FUNGUS DISEASES.

APPLES, PEARS, AND QUINCES.



Bitter Pit.

Bitter Pit.—Apples apparently sound soon develop, on keeping, unsightly spots, which make them unmarketable. This is, next to black spot or apple scab, the worst fungus disease of the apple.

The disease shows sunken brown spots, as if the fruit had been trodden on with nailed boots. When the apple is cut there are, below the spots, pieces of brown spongy tissue, bitterish to the taste, sometimes extending to the core. Dr. Cobb, D. McAlpine, Masset, the mycologist at the Royal Gardens, Kew, and other vegetable pathologists, have seen no evidence that would prove the disease to be caused by a fungus. Some authorities say it is probably caused by a micrococcus, but the disease is not contagious. There is no effective remedy, except to avoid soils liable to this disease in localities where it is troublesome. Nurserymen should be very careful against using scions from diseased trees. Cleopatra, Rymer, Esopus, Spitzenberg, and Scarlet Nonpareil, amongst the better sorts, are most liable to this disease. McAlpine expresses the opinion that it is caused by defective nutrition, and that nitrogenous manures aggravate it, and suggests correcting this tendency by a more liberal use of potash and of lime, especially gypsum. In Western Australia, as well as other countries where bitter pit is troublesome, trees badly affected in damp localities on the plains hardly ever show the disease on well drained soils and on the gravelly slopes of the Darling Ranges. Pick and burn all diseased fruit.

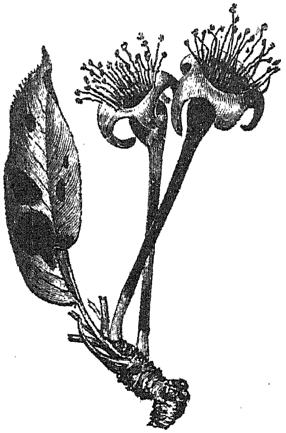
BITTER ROT OR RIPE ROT (*Glæosporium versicolour*, Berk.).—Attacks ripe apples, pears, grapes, and peaches. Appears about the time the fruit begins to ripen; the first symptoms are small circular brown spots, which rapidly enlarge and assume various shades of brown in concentric rings. After four or five days small pustules appear on the brown spots. These burst when the spot has become a little larger, and give exit to a light salmon-coloured mass composed of the spores of the disease. This goes on the diseased spots, throwing up ring after ring of pustules until the whole apple, within a fortnight, becomes rotten.

The disease is often noticed in the storeroom; it does not attack all varieties of apples with equal virulence; many of the culls in packed fruit are due to this fungus.

Remedies.—Carefully pick up and destroy every rotten fruit in the orchard; do not throw diseased fruit into the pig-sty, but burn it. Prevention is the only practical way of combating this disease; drain the land if necessary, spray in winter with strong winter spray. Spray the fruit until late in the season with ammoniacal carbonate of copper, eau céleste, or with potassium sulphide ($\frac{1}{2}$oz. to gallon of water).

BLACK SPOT OR SCAB (*Fusicladium dendriticum*, Eckl.).

APPLE OR PEAR, BLIGHT OR SCAB (*Fusicladium dendriticum*, Eckl.).—A common disease in moist climates. "The losses sustained from its attacks (says Dr. Cobb) vary from 10 to 90 per cent. of the crop." For about a month after the fruit sets the scab plays great havoc in orchards where it is abundant. It is easily recognised. Dark velvety green patches turning to brown or blackish scab-like spots appear on the leaves and fruit, arresting growth and causing the parts to become distorted.



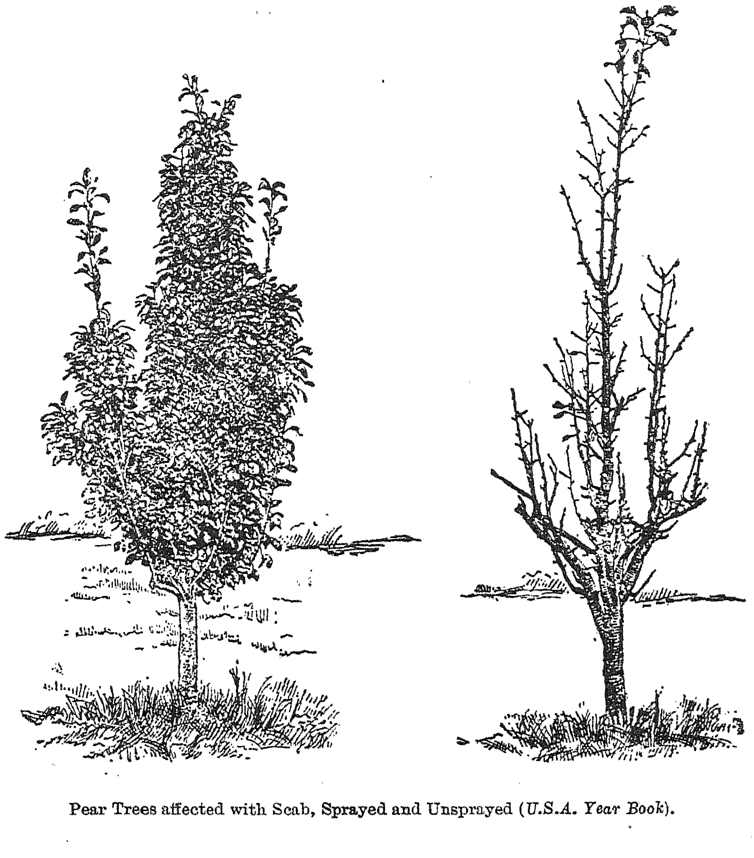
Pear Scab (*F. pyrinum*).

Closely allied to the fungus which causes pear scab. (*F. pyrinum.*)

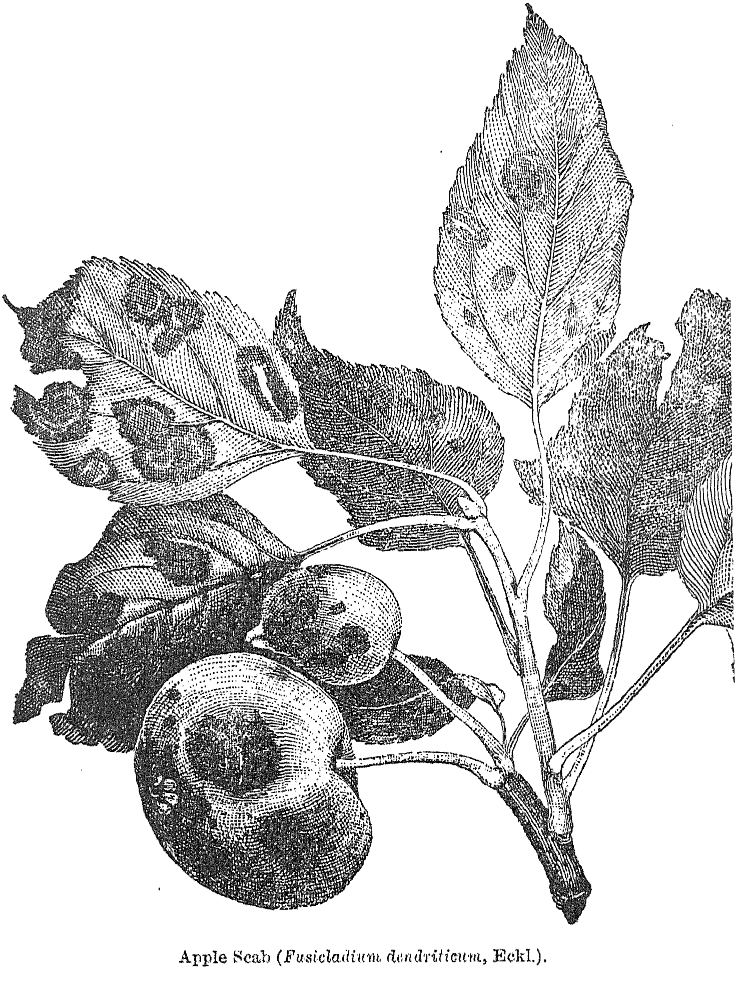
Some affected trees blossom most profusely, and hardly ever set their fruit, or else, if these set and grow, they often split and crack.

Remedies.—Preventive remedies are the best. Destroy affected leaves and worthless fruit by fire or otherwise. Spray affected trees with Bordeaux mixture or ammonia carbonate of copper, late in the winter after pruning. Again at half-strength, while the leaves are appearing and as the blossoms begin to unfold from the buds, and again as the blossoms fall, and fourthly, when the fruit is the size of marbles. At that time 1oz. of Paris green in 12 gallons of the Bordeaux mixture will hold the codlin moth in check where this troublesome insect has established itself. It is important that the early sprayings should be made as directed. In bad cases an extra spraying is given a few weeks after the one given whilst the blossoms are falling. Do not neglect the trees during an "off" year because there is little fruit, the spores, living and thriving on branches and leaves as well will cause great loss the following season.

The following illustration tells graphically the result of spraying pear trees to protect them from scab disease :—



Pear Trees affected with Scab, Sprayed and Unsprayed (*U.S.A. Year Book*).



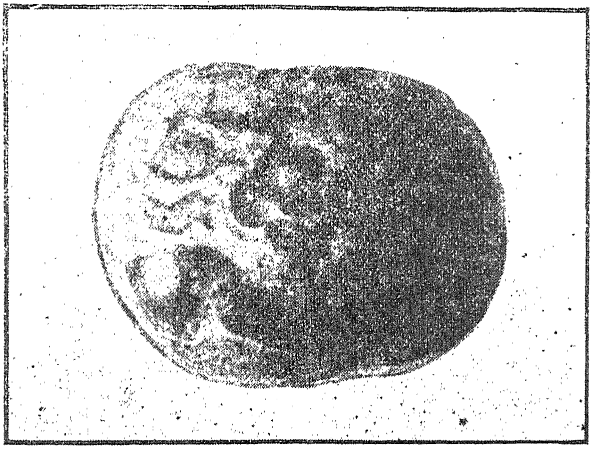
Apple Scab (*Fusicladium dendriticum*, Eckl.).

Brown Rot of Fruit (*Monilia fructigena*, Pers.).—Attacks apples, plums, cherries, peaches, almonds, and other kinds of orchard fruit. It is caused by a fungus which produces its spores in chains, and hence called *Monilia fructigena*.

Although more frequently observed on the fruit, it occurs also on the young shoots, leaves, and even the flowers.

On the leaves in the spring it shows as thin, velvety, olive-brown patches, consisting of barrel-shaped spores, originating from mycelium present in the tissues of the leaf.

At maturity the spores are carried by rain, wind, insects, birds, and on the surface of healthy fruit. On these the disease first shows as brownish scattered patches on the skin. The fruit attacked does not readily rot, but dries up and remains in a mummified condition through the winter, either on the ground or on the tree. From these, innumerable blackish sclerotic, bearing in the spring a crop of spores, renew the infection.



Brown Rot (*Monilia fructigena*, Pers.).

This disease is, in places, the worst the plum-growers have to deal with.

The remedy consists in picking, removing, and burning all these mummified fruit. Spray thoroughly before the buds burst. Suppress bark and skin-nibbling insects in the spring. Spray with Bordeaux mixture when the fruit is forming.

CANKER is first caused by a bruise or a laceration of the bark of the branch, and the invasion of the wound by a fungus (*Nectria* and other fungi), which prevents a healthy healing up of the damaged tissues. The claws of climbing animals, the bite of gnawing insects, and other causes bring about this trouble.

Remedies.—Remove the cause of canker. If the bark is never wounded canker will never appear. Prune the diseased branches and burn the cankered parts. Lime, sulphur, and salt wash.

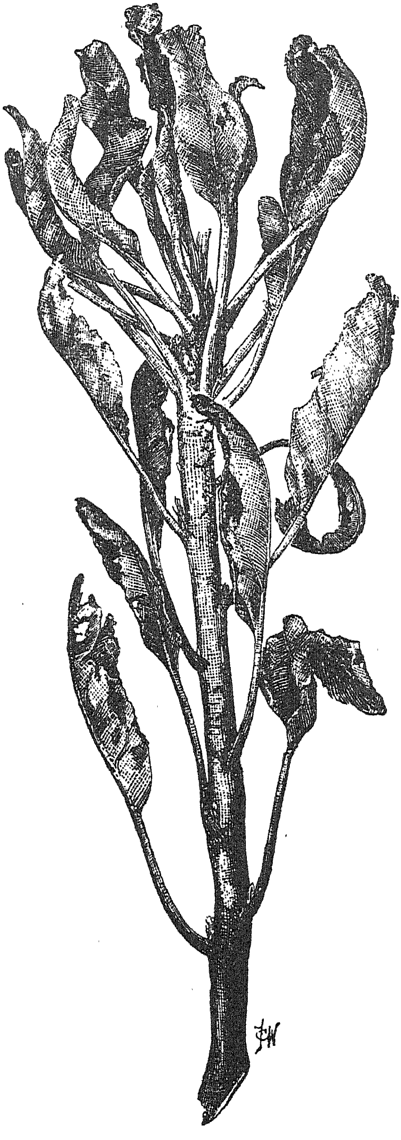
Canker can also be cured by paring off the bruised, ulcerated wounds, and then covering the diseased part with a paste made of clay mixed with hydrochloric acid. Painting the affected part with the acid used by tinsmiths under the name of "spirits of salts" is also a simple and efficacious remedy, the acid destroying the fungus of the canker without damaging the tree. Handle the acid carefully, as, if splashed on the clothes, it will burn holes in them.

MOULDY CORE.—A diseased condition brought about by the presence of common mould in the core of certain varieties of apples, generally by the fungus of brown rot, the infection starting from the centre instead of from the circumference. Outwardly such apples appear quite sound, but on cutting them in halves the core is found to be in a mouldy or half rotten state. Sooner or later the whole apple becomes rotten, the rot working from the centre outward. The mould gains entrance to the core of the apple through the eye; those varieties with an open blossom end being more subject to the disease. Those varieties of apples with large open pip-holes (concludes Dr. Cobb) are not likely to prove good keepers.

CRINKLE, OR PIG FACE.—An obscure disease of the apple. Mr. McAlpine says of this disease:—"Besides the recognised Bitter Pit, which causes small brown depressions on the surface, another appearance was noticed, particularly in Rome Beauty and Five Crown Pippin. The skin is apparently quite sound, but a little darker towards the eye end, and, if cut across, brown, dead tissue is found immediately beneath the skin, or between the skin and the core. There may be actual cavities in the decaying flesh; and the diseased patches do not taste bitter. Although many varieties not subject to Bitter Pit exhibit the crinkle disease, it is probably likewise due to disordered nutrition. The upper end of the apple ripens first, and if, from any cause, a proper supply of nourishment fails to reach it, there would be decay and ultimate death of the cells. I have given the common name of 'Crinkle' to this disorder, because the upper surface of the fruit is thrown into rough folds, giving it, usually, an uneven and crinkled appearance."

POWDERY MILDEW OF THE APPLE, PEAR, AND QUINCE (*Podosphæra Kunzei*, Lev.), sometimes called "fire blight." Very destructive to nursery stock. Attacks the apple, peach, quince, cherry, and other plants belonging to the *Rosaceæ*. It attacks mostly the young leaves, spreading over both surfaces, and showing like white felt. Spray with Bordeaux mixture or with liver of sulphur (potassium sulphide) solution. In summer time, sulphur the trees. Cleopatra and Stone Pippin appear to be especially liable.

TWIG BLIGHT.—Small stunted rosettes of leaves grow in the spring on the previous year's wood, and fail to grow into healthy shoots. Later, in the early summer, strong shoots spring up from the base of the limbs instead of from the extremity. No pustules are noticeable on the leaves, which have an unhealthy appearance. This serious trouble, which is still under observation, has been found associated with two causes, either independently or concurrently.



Powdery Mildew of the Apple.

The one a bacterium (*Bacillus amylovorus*, Burr.), which in the old cases of blight, winters over in the blighted parts. From these diseased parts a watery exudation at times takes place in the spring, which is visited by insects, and by them transmitted to the opening blossoms or to the sap vessels of the tree. Once within the tissues of the host, the microbe may spread indefinitely.

Another cause, producing a similar appearance, has been traced to the presence in the ground of a mould which grows on the surface roots and spreads over them web fashion, thwarting their growth, with the results described.

In the first instance, spraying early, to keep off inoculating insects, confines the trouble to a few trees only, and may also disinfect the infested exudation. All blighted parts should be carefully cut off below the lowest manifestation, and burnt each autumn. A good precaution is to disinfect the knife, after cutting through a diseased spot, by dipping in carbolic acid.

Cultivate thoroughly and fertilise liberally to help the trees to throw off the disease.

In the second instance, the ground should be deeply ploughed, thoroughly drained and liberally limed and manured, so as to encourage the growth of the roots in healthy surroundings. (*See* Pear Blight.)

WATER CORE.—Easily known by the watery or waxy appearance of either the whole or part of an apple. The apple is quite sound to outward appearance. More prevalent in moist seasons, especially in early sorts. Winter varieties are comparatively free from it. Stone Pippin and Five Crown Pippin are somewhat subject to it.

PEAR BLIGHT, OR FIRE BLIGHT (*see* Twig Blight, p. 110).—A bacterial disease which attacks apples, pears, quinces, and other trees. It works in the tissues between the bark and the growing wood, only during the growing season.

Some varieties of pears, like the Duchess and Kieffer's Hybrid, resist the disease better than others, such as Bartlett and Clapp's Favourite.

The blight microbe is greatly influenced by climatic conditions; warm and moist weather, with frequent showers, favouring it. These conditions are prevalent in the month or two following blossoming time. Dry, cool, and sunny weather hinders it, while very dry weather checks it; and it remains dormant during the winter. The line of demarkation between healthy and diseased wood is then often quite marked.

In the spring, when sap pressure runs through the tree, the blighted parts are recognised by the moist and fresh appearance of the bark, as contrasted with the old and dry bark of the previous summer. The gum exudes from various points, and runs down the tree in long lines, when bees and other insects which are attracted by it carry the microbes to the blossoms, where they gain an easy entrance into the healthy tissues under the bark. These blossoms soon wither and die. Tender twigs are often inoculated by nibbling insects, and show signs of the blight.

Some observers contend that because the microbe flourishes best in tender tissues, anything which tends to luxuriant growth of the tree, such as pruning, manuring, cultivating, are to be deprecated; and they advise leaving it to the trees to fight their own battles. If this be the correct treatment, it appears to me that it is time, labour, and money wasted to grow apples, pears, and quinces in those places where the disease is prevalent, as stunted, hungry trees are even less profitable than blighted ones.

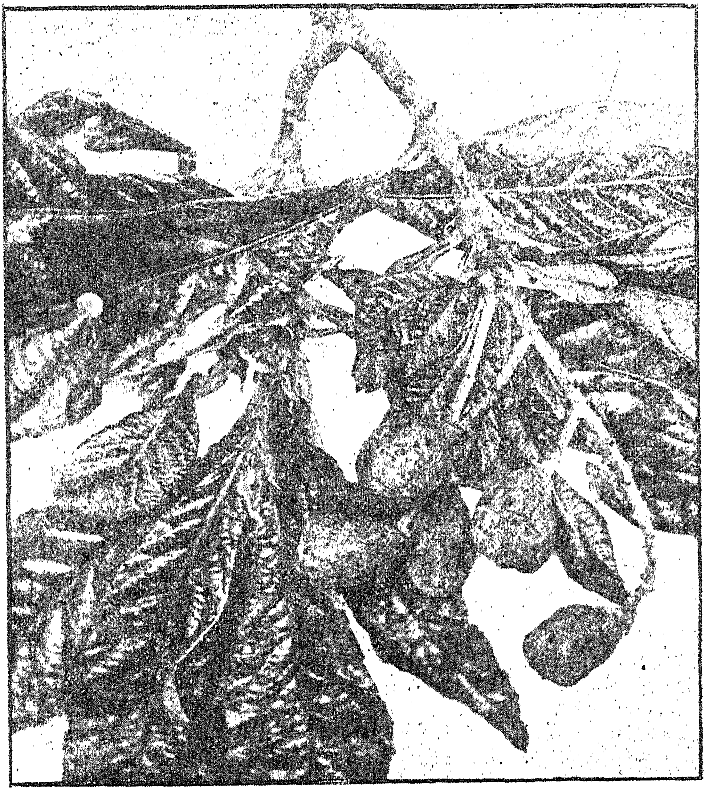
Little is known as yet concerning the best means of combating this bacterial disease; and the subject is worth experimenting with. Until the results of well planned out experiments have proved the contrary, I would recommend deep and good cultivation, and fertilising with gypsum, potassic and phosphatic fertilisers, efficient deep drainage, carefully cutting off all diseased branches and twigs, and burning them in the winter, care being taken to cut into healthy wood and to disinfect the secretion on the knife after going over a diseased tree. Lastly—and I believe that much good can then be done in checking the spread of the fire blight—spraying the diseased trees at frequent intervals with an antiseptic solution in the spring, during that period when the infected sap oozes through the bark, and is taken up and carried about by foraging insects.

Amongst the sprays which are likely to be attended with good results, I would recommend a two per thousand solution of corrosive sublimate, or a weak carbolic acid solution.

As a vehicle for these powerful disinfectants, a decoction of eucalyptus (blue gum leaves) would probably be found helpful. The leaves should be bruised when freshly gathered, and soaked in tepid water—1lb. of leaves to 1 gallon of water—then, with the addition of the substances mentioned above, the decoction should be sprayed on the trees. It is sticky, and adheres quickly. All insects will abandon any foliage where this spray is used.

LOQUAT.

BLACK SPOT (*Fusicladium eriobotryal*).—To commercial interchange with the Eastern States we owe another disease of our



Black Spot of the Loquat (*Fusicladium eriobotryal*).

orchard trees. The loquat, until lately, was, almost without exception, raised from seeds from locally grown fruit, and the plants were healthy.

Whether the disease was introduced by imported fruit or on nursery stock, it is not easy to determine.

This blight is caused by a fungus closely allied to that which produces the scab diseases of apples and pears, and its botanical name is *Fusicladium eriobotryal.*

Diseased loquats were first submitted for identification to this Department in 1898. It has since been spreading, and this year it is reported to have done serious damage to the loquat crop in a number of gardens.

The fruit is attacked, when half grown, by brownish black spots, which soon extend, stop the further development of the fruit, and disfigure its appearance. After a time brown spots show on the leaves, and assume a darker colour. The fleshy part of the fruit becomes desiccated, and the skin seems to cling to the stones. A large proportion of the crop may, in a short space of time, be rendered absolutely unsaleable.

Remedy.—Is the disease beyond control? Experiments in that direction have not yet proclaimed that fact; on the contrary, judging by analogy, and knowing how readily the *Fusicladium* fungus, or scab of the apple and the pear, and also of the vine, yield to treatment, there is every reason to augur that the black spot of the loquat likewise will be amenable to treatment.

That treatment must be protective, and cannot be curative, as the fruit once spotted can never be freed of the blemish.

Spraying with Bordeaux mixture soon after blosoming, when the petals have fallen, and the fruit has just formed, should be found an effective protection. This treatment should be renewed when the fruit is half grown, in the winter, when the weather is likely to remain fine for some time. If necessary, a third spraying, a fortnight after, would copper-plate the tree against an attack of the fungus.

Collect and burn all diseased fruit, and sweep and burn the leaves as they fall from the tree.

I shall endeavour next year to test the value of Bordeaux mixture, as well as other fungicides, in dealing with this blight. Considering the wetness of the season, when the disease appears, I would favour the Bordeaux mixture modified by addition of molasses, to ensure a better adherence to the trees.

Stone Fruit.

Almonds, apricots, peaches, and nectarines, as well as plums and cherries, are attacked by fungus diseases, which, if not in every instance identical, are sufficiently closely related to be described under one heading, and are amenable to similar treatment.

Curl Leaf (*Exoaseus deformans*, Eckl.).—Sometimes simply called the "curl," owing to the leaves becoming distorted and crumpled, early in the season. After a time a delicate whitish bloom, caused by the spores of the fungus, show on the surface. The young shoots are also at times swollen and distorted by the fungus.

When the attack is bad, the trees at times lose their leaves before midsummer, and later on a fresh lot of healthy leaves grow; but in the meanwhile much damage has been done to the trees.

Some varieties, such as the Flat China, the Elberta, and Royal George peaches, are more subject to this disease.

Those branches which are most affected by the curl fungus are seldom fruitful, and should be cut back and burned. The mycelium hibernates in the bark, pith, and medullary rays of the branches and twigs, so that it reappears each year. Massee has demonstrated that the mycelium does not travel backwards from the point of infection, but forwards—in other words, it follows the new growth.

An allied disease of the plum, called "Pocket Plums" or "Bladder Plums," is caused by the fungus *Exoaseus pruni*, Eckl., and should be treated in a like manner.

Brown Rot.—This disease is described above. It is caused by a mould or fungus, called *Monilia fructigena*, which attacks various parts of the plant, leaves, blossoms, twigs, and fruit.

Gumming, Sour Sap, or Die Back.—There are many diseases characterised by a gummy outflow from the diseased parts or from their neighbourhood. Amongst plants exhibiting this are trees like the mulberry, olive, vine, fig, and vegetables like potatoes, turnips, beetroot, and many others. As yet, however, no investigations have been carried out carefully enough to give satisfactory explanations of them. It is, however, probable (says Tubeuf) that they are primarily due to errors in cultivation, while the bacteria which are always found associated with them are of secondary importance as disease-producers.

Gumosis or Sour Sap, which are results rather than causes, may probably be traced to an abnormal condition of the soil. Sour Sap, when the roots die first, may be due to too much water; and when the tops die first, to the sudden lowering of the temperature. A checked sap circulation from the stock to the scion may also bring about the trouble. Improperly fed trees, or trees supplied with indigestible (unassimilable) food, are less apt to withstand the attack, and succumb.

The trouble shows in a variety of ways. The young spring shoots suddenly collapse and wither. In that case, cut hard back before the poisonous sap can travel back to the healthy parts. In other instances, the foliage and twigs seem all right, but the fruits, when the size of a walnut, stop growing, turn brown, and show a gummy exudation on dark-coloured patches. A microscopic examination discloses the presence of numerous fungi, often of the *Macrosporium* tribe. A liberal dressing of 5lbs. to 10lbs. of superphosphate of lime in the winter often saves trees predisposed to gumming.

A somewhat similar disease, supposed, however, to be of bacterial origin, at times attacks young apricot trees, when two to four years old. It is recognised by the leaves or part of the tree turning yellow and falling off. The limbs from which the leaves fall, when cut through, shows a black heart.

Prune these limbs back as far as they show the black heart, and also shorten the limbs that are not diseased. Disinfect the knife after it has come into contact with the diseased sap.

LEAF RUST (*Uromyces Amygdale*, Cook, and *Puccinia pruni spinosæ*, Pers.).—Very prevalent in damp localities (late in the summer) on peach trees, and also the almond, nectarine, apricot, and plum.

The leaves are picked with yellow spots on the upper surface of the leaf; these yellow spots are often surrounded with a purplish ring, and they have on the other side of the leaf brown spots of fungoid growth. The leaf tissue attacked by these spots becomes eaten away into holes, and the leaf falls, beginning from the butt end of the branches, and the wood does not ripen as it should do, thereby enfeebling the tree.

Remedies.—Collect and burn all affected leaves to destroy the summer spores, which remain inert during the winter only to infect the next year's growth. Spray early in the season with Bordeaux mixture, half strength, or other fungicides.

LEAF SCALD (*Entomosporium Maculatum*, Lev.) attacks the leaves of apples, pears, quinces, peaches, cherries, etc. (says Massee). These fall early in the season, and in bad attacks leave the trees defoliated. A second growth of leaves follows, and at times these suffer in the same way. As a consequence, the trees are much weakened.

Small red spots appear on the upper surface of leaves when still young; these increase in size and become brown, having one or more minute black spots slightly above the general surface. If the spots are numerous, the leaves become brown, shrivel, and fall off. If the leaf is older, with rigid tissues, it retains its shape, but falls to the ground.

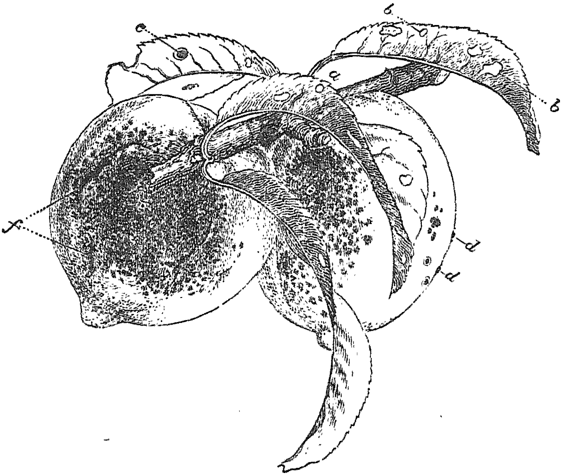
On the branches the spots are at first reddish, becoming slightly sunken with a central elevation and blackish in colour in the coalesce, sometimes encircling the branch, in which case the portion above the diseased area dies.

The fruit of pears is sometimes spotted by the disease.

Bordeaux mixture keeps the blight in check.

SCAB.

PEACH FRECKLE causes dark spots on the skin of maturing fruit, which present a freckled look. These spots are the result of the attack of fungi, and amongst them the *Cladosporium carpophilum*. Its filaments do not enter the peach, but draw their nourishment through the skin. It is said that the disease hastens decay, and that affected fruit will not stand long keeping. An early application of Bordeaux mixture stops its progress. Potassium sulphide, half ounce to the gallon, is also recommended.



Scab and Peach Freckle.

ROOT KNOT often shows on peaches, plums, etc. It is caused by a fungus called slime mould, related to the one which causes the finger and toe disease of beetroot, carrots, etc.

Pare out the excrescences and wash with an antiseptic lotion. If it is a young tree and is badly affected, replace by a healthy one.

SHOT HOLE DISEASE (*Phyllosticta circumcissa*) attacks the leaves of apricots, almond, peach, nectarine, and other stone fruit trees. Appears as spots upon the leaves in summer, and these spots assume definite outlines, and often fall out, leaving holes like shot-holes. The leaves fall early, preventing the fruit from maturing. These are also attacked, and at times disfigured.

The accompanying figure illustrates the effect produced by the treatment.

Shot Hole on Apricot. The healthy growth took place since spraying.

Remedies.—Burn leaves as soon as they fall. Bordeaux mixture, half strength, or ammoniacal carbonate of copper applied several times during the season, beginning as soon as the leaves appear.

CITRUS TREES.

Trees of this species are subject to a number of diseases, the most serious of which are—

GUMMING, COLLAR ROT, MALDI GOMA.—A serious contagious disease of stone fruit and citrus trees (*see* remarks under "Twig blight" and "Gumming of stone fruit"). It seems to be a cracking in the bark and an exudation of the gum, which runs down the tree and affects the bark underneath. Abrasion of the bark with the hoe, plough, and other field implements, deep planting, defective irrigation, and water standing round the trunk favour the disease; also sun scorch and late cold weather, which hurts the shoots.

The disease is an obscure and serious one, and has not yet been thoroughly investigated. Supposed to be produced by a microscopic fungus (the *coryneum Beijirinchi*) which develops in the vegetal cells and change into gum the cells which constitute the pith, as well as those of the medullary rays, and sometimes also the woody tissue. In mild cases, recovery has followed the cutting out of the bark and gouging out the dark decayed wood underneath with a half-moon chisel until the sound wood is reached, which is then coated over with shellac paint or some other protective cover, preferably an antiseptic one, such as carbolic acid solution. Burn all diseased bark. Affected trees are profuse bearers for a season or two, and then generally die out. If a spot where the gum is oozing out is cut out in diseased trees, a dark channel is seen underneath, extending generally from the root to the top of the tree, following fibro vascular bundles of wood tissue; this wood is sometimes dry (and so hard that no sap could flow through its vessels) or rotten and decayed. In the majority of cases the best plan is to root up and burn the tree.

MELANOSE must not be confused with the disease called Rust or Madri. The numerous small madder-brown spots characteristic of the disease have (says Dr. Cobb) a tendency to group themselves in curved lines, which run together and form larger patches. Both Madri (caused by a mite) and Melanose at times occur together on the same orange. The leaves are attacked as well as the fruit.

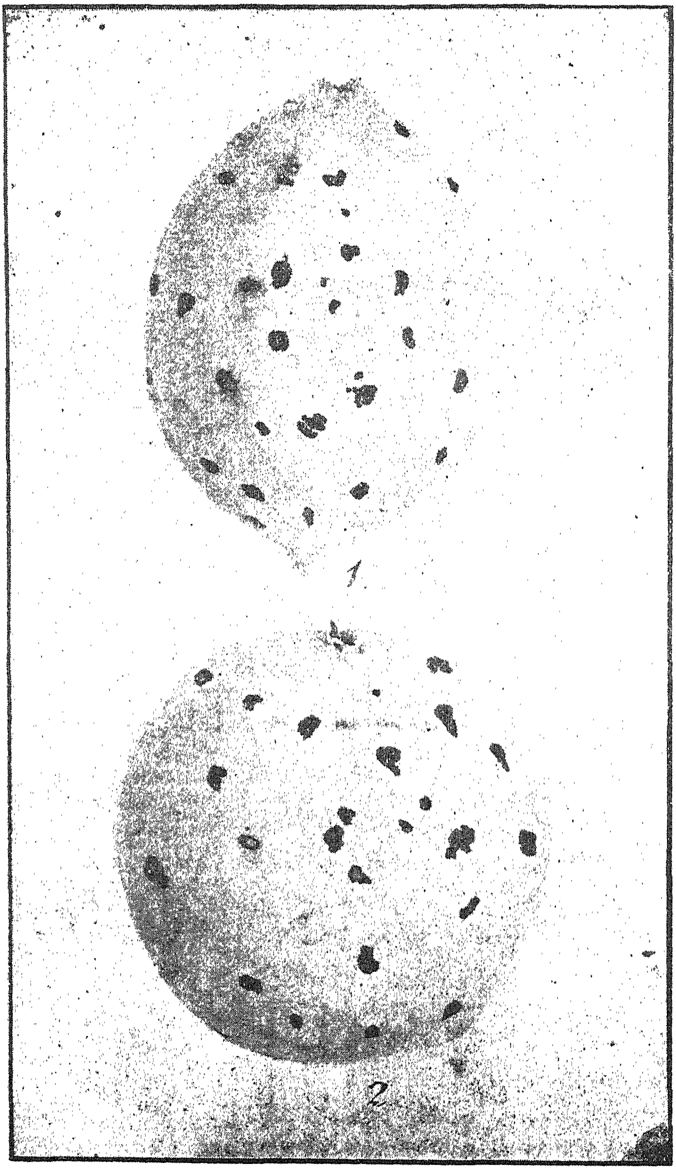
Remedies.—As soon as the new crop has set, begin spraying with Bordeaux mixture of weak strength, and keep on spraying, if necessary, every fortnight until the fruit is half grown. The addition of a little soap will cause the spray to wet the citrus leaves better. Paint the trunk and limbs with a thin whitewash, or with full strength Bordeaux mixture. Apply to the ground under each tree one pound of sulphate of iron in 25 gallons of water; also give to the ground a dressing of three to four pounds of bonedust and the same amount of kainit per tree, and avoid dry blood or organic nitrogen fertilisers. Make sure that drainage is good.

BLACK SPOT OF CITRUS FRUIT (*Phoma citricarpa*, McAlp.)—This disease, known also as anthracnose of citrus fruit, is on the list of prohibited diseases, and fruit showing signs of them are destroyed at the ports of entry.

For the information of growers, and also of the officers in charge of the disinfection sheds at the ports of entry, I reproduce a plate from Mr. D. McAlpine's Monograph of Fungus Diseases of Citrus Trees in Australia, together with a summary of the description which accompanies it.

The disease, it is stated, has not been met with in Victoria, but it is quite common on oranges, mandarines, and lemons sold in Melbourne and suburbs, and imported from Sydney.

The fruit is affected by spots, round and sunken and of a dark brown colour; at first, whitish or greyish towards the centre. These are pustules which allow the escape of spores, which may be



Black Spot on Citrus Fruits.

wafted by the wind, or carried by hands, clothing, insects, animals or empty cases. Thus is the disease rapidly and widely spread.

It bears some resemblance to another black disease of citrus fruit called "Melanose," and also to a disease known in Italy as "La Nebbia," which is, however, caused by a different fungus.

The effects of the disease on the fruit is that, besides being unsightly and rendered almost unsaleable, they soon become rotten, and fall a ready prey to "Blue Mould," etc., so that all such should be rigidly excluded from shipments to distant markets.

The fungus is found on still green fruit, and spreads most rapidly when the fruit ripens.

Treatment.—The skins of diseased fruits should be burnt, in order to prevent the spores reaching fresh-growing fruits. The cases containing diseased fruit should be disinfected by steaming or by dipping in boiling water for a few minutes. Spray the trees with Bordeaux mixture as soon as the fruit sets, and again every few weeks up to within a month of the time of picking the fruit.

SOOTY MOULD OR BLACK SMUT.—Fumagine follows the attacks of aphides and of scale insects, forming a sooty black membrane, which feeds on the sweet fluids (honeydew) secreted by these insects, and which falls on the leaves, branches, and fruits of the last plant they live upon.

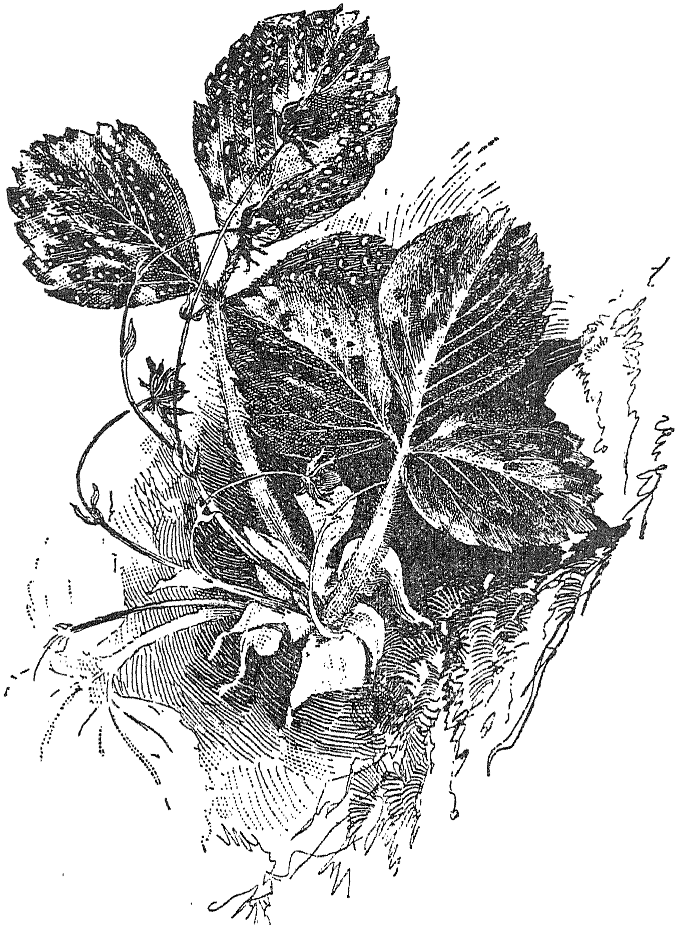
The growth of the trees affected is retarded in consequence of light and the respiration of the plant being interfered with. The insects further injure the plant by sucking the nutritious juices from the cells, and blooming and fruiting are, in consequence, checked or suppressed, and the market value of the fruit lowered.

Remedies.—Spray two or three times at intervals of one or two weeks in the winter, and after the fruit crop has been picked, with kerosene emulsion or resin and soda; wash or fumigate with hydrocyanic acid gas.

Better still, collect and procure parasites and predaceous insects on the aphis and the scales, which are the primary cause of the sooty mould. When parasites are present, spraying or fumigation will do more harm than good, and will tend, by destroying the beneficial insects, to intensify the trouble.

ROTTING OF CITRUS FRUIT.—Considerable loss is at times experienced during transportation or storage of citrus fruit. The cause is due to one of the blue moulds—*Penicillium digitatum.* This fungus grows on the fruit from a spore, which germinates and penetrates the tissues in the form of white threads, and feeds on the juices; after a time they show outward as a white mould which, when it fructifies, appears like bluish-green dust. The disease occurs more in the fruit store than in the orchard. Sulphur fumigation minimises its spread. It mostly attacks bruised fruit.

STRAWBERRY LEAF-BLIGHT OR SUN-BURN (*Sphærella fragariæ*, Tul.)—"This is the only serious disease of the strawberry plant now known in Australia," says Dr. Cobb. It is very widespread, and does a great deal of damage, causing a loss of from five to ninety per cent. of the crop.



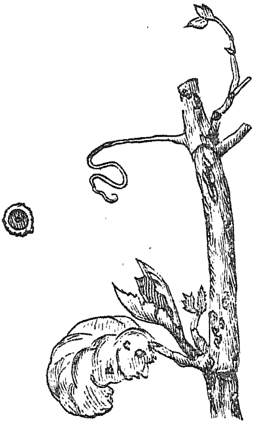
Strawberry Leaf Blight (*Sphærella fragariæ*, Tul.)

Small purple or red spots appearing on the leaves. They eventually become larger and browner, making the leaf appear blotched. The growth of the young berries is also checked, leaving them juiceless, shrivelled, and green, and not larger than peas.

Remedies.—In mild cases, destroy all affected leaves; this will prevent the disease spreading. In bad cases mow the bed close, rake up the leaves immediately and burn them; or the bed may be covered with dry litter and then burnt off. The strawberry plant will soon throw up clean leaves if the weather is propitious. Spray with Bordeaux mixture or ammoniacal carbonate of copper, at intervals of two or three weeks, beginning as soon as the fruit is picked, or preferably, early in the season and before blossoming.

GRAPE VINE.

GRAPE ANTHRACNOSE OR BLACK SPOT (*Sphaceloma ampelinum*, De Barry—*Glœosporium ampelinum*, Sacc.)—Two distinct forms of Black Spot occur in Australia. Anthracnose, however, is the more common as well as the more troublesome of the two. It is easily recognised, when the spots reach a certain size, by the centre becoming white, owing to the fructification of the fungus which causes the disease. On account of its appearance, the disease has been known as "bird's-eye rot." The favourable conditions necessary to its spread are warmth and moisture, either in the form of damp weather or heavy dews, accompanied by skies so cloudy as to prevent quick evaporation in the mornings. Hence it is preferable, in establishing a vineyard, to plant those varieties much affected by Anthracnose on slopes exposed to the morning sun.

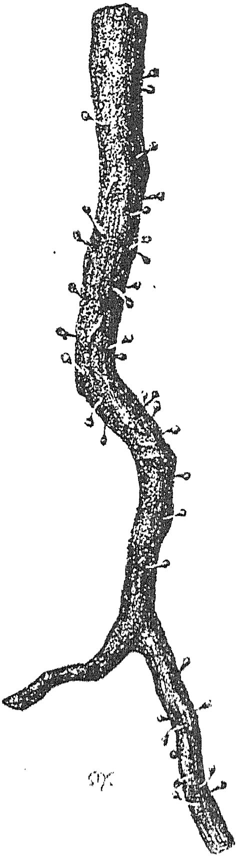


Anthracnose or Black Spot.

The winter treatment is by far the most efficacious in the case of Black Spot, and the varieties most subject to it should be particularly attended to, viz., Carignane, Grenache, Œillade, Clairette (syn. Blanquette), Aramon, Blue Portuguese, Black Hamburgh, and many white table-grapes; the Muscats; and amongst the American grapes, V. Rupestris and V. Riparia.

Remedies.—Sulphate of iron wash after pruning. Burn the trimmings after pruning. After the leaves open, use sulphur, lime, and powdered green copperas. Should the disease persist in spite of the winter treatment, it is recommended to dust the vines two or three times, at a week's interval, with cement and sulphur mixed in equal proportions.

Cancerous Anthracnose of the Vine.



Pourridié, or Mouldy Root of the Vine.

Mouldy Root (Pourridie).—This disease is named from the French word *pourrir*, to rot. I have noticed it in a few vineyards on badly-drained ground, at Corowa, Tamworth, and on the Richmond River in New South Wales, and at Jarrahdale in this State. It is difficult to eradicate. In this disease the roots are covered with a white mould which causes them to rot, the consequence being, first, a falling off in the yield per acre, and, finally, the death of the vine. The symptoms of the disease are those of general signs of weakness and debility. The canes grow thinner and thinner, the leaves smaller, and, after a while, the trunk assumes a "cabbage-head" shape, and can be easily pulled out; the roots being rotten, brownish, and spongy. The roots of the vines affected by this parasite show, between the bark and the wood, patches of felted mouldy threads. Around the trunk, in damp soil, a growth of white cottony threads is seen, which spreads through the soil, following the roots and extending like a stain of oil.

Remedies.—Modify the conditions of the soil by draining and liming to sweeten it and make it more healthy.

When the disease is just showing, pulling out the attacked plants, collecting roots and all, and burning them, to prevent the diffusion of these spores (seeds of mould), is advisable. Manuring the vines to stimulate their growth helps them to get over the weakening effect of the mould.

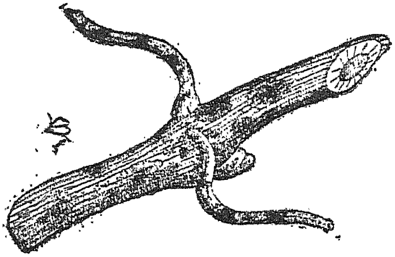
I have seen good results attend the application in winter-time, on the main roots and round the stock of the vine, laid bare for the purpose, of a mixture of kerosene oil stirred into a white-wash of thin lime or a solution of sulphate of iron.

DOWNY MILDEW (*Peronospora viticola*, De Barry).—Appears in small frost-like patches on the under surface of the leaves, finally causing yellowish discolouration on the upper surface. Berries are also affected, remaining small and hard and turning brown.

Remedies.—Two or three applications of Bordeaux mixture.

This disease does not exist in Australia, but causes considerable damage in American and European vineyards.

OIDIUM TUCKERII (Powdery mildew).—One of the most prevalent diseases wherever the grape vine is extensively cultivated.

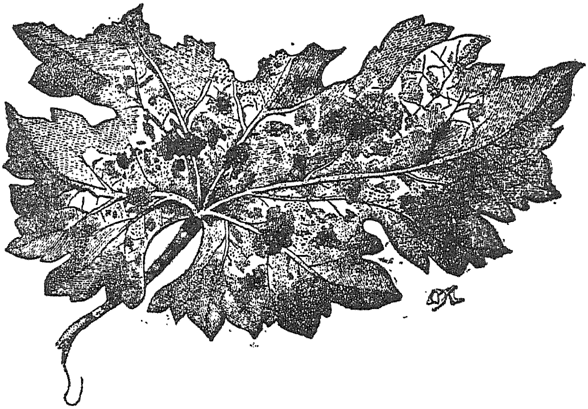


Vine Stems Showing Stains of Oïdium.

Before a remedy for this disease had been found it swept out of existence the vineyards of Madeira. Some twenty to thirty years ago a number of small vineyards in Western Australia were rooted out or allowed to run wild on account of this disease, which, at the time, was little understood.

Although one of the most troublesome of the grape vine diseases, it is at the same time one of the easiest to subdue, provided that the treatment be carried out with care.

Like all powdery mildews, the parts attacked are covered over by the web-like threads of the mildew fungus. It only attacks those organs when green. It at first appears as a dirty white powdery film, possessing a characteristic mouldy smell. It leaves stains on the wood. Should it appear early, the flowers will fail to set; then the more tender leaves will be covered with patches of microscopic threads, which will stop their growth and cause them to shrivel up and dry. The berries are most severely attacked. The effect of the parasite on the skin is to tighten it and cause it to lose its elasticity, so that the berries either dry up or burst open. The ripening does not progress satisfactorily, and, when fermented, the juice produces a nasty wine with a mouldy taste or flavour, and one which does not keep well.



Oïdium of the Vine.

Varieties most attacked by oïdium, and cultivated in Australia, are:—Albilio, Carignane, the Cabernets, Chasselas, Black Hamburgh, Gouais, the Muscats, (Œillade, Pedro Ximenes, Riesling), Roussanne (White Hermitage), Shiraz (Black Hermitage), Tokay (Green Hungary), Trebbiano (Ugni Blanc), Verdeilho, and a great many table grapes.

Varieties not much attacked.—Aramon, Dolcetto, Grenache (Roussillon), Mataro (Mourvèdre), Marsanne (White Shiraz), the Pinots (Burgundy), Sauvignon, Morrastel, Aspiran.

Varieties least attacked.—Malbec, Catawba, and Isabella, two varieties of an American vine (*V. Labrusca*), and, in fact, most American vines.

Sulphur is the readiest cure for oïdium. The finer the sulphur the better, and for that reason "precipitated" sulphur is supposed to have greater virtues than either "ground" or "sublimed" sulphur.

Moist, warm, and damp weather favours the growth of the fungus, and at the same time checks the formation of sulphur fumes. Great heat, such as occurs in the summer, kills the blight. It is best to sulphur in the morning, when the leaves are still damp with dew, and before the high winds begin to blow. The months of November and December are, with us, the most suitable for sulphuring, and in later districts it is even practised in January.

Sulphuring, to be efficacious, must be used as a preventive remedy. If it is delayed until the formation of the fruits of the fungus (*perithicia*) it does not act so readily, as the seeds of the blight plant (*ascospores*) are then more resistant than are the growing mycelial threads of the fungus.

The sulphuring is best done with the aid of specially made sulphur bellows. Some simply put the crushed sulphur into a sugar bag and shake it over each vine, but this method is wasteful of the sulphur, and does not distribute it so effectively as do the bellows.

In persistent cases, and in districts favourable for the growth of the fungus, as many as four sulphurings are given, but generally two or three will be found sufficient.

The quantity of sulphur per acre varies, according to the state of fineness of the powder; the sulphur distributer used; the season, and the prevalence of the disease, from 15lbs. to 60lbs. of sulphur per acre.

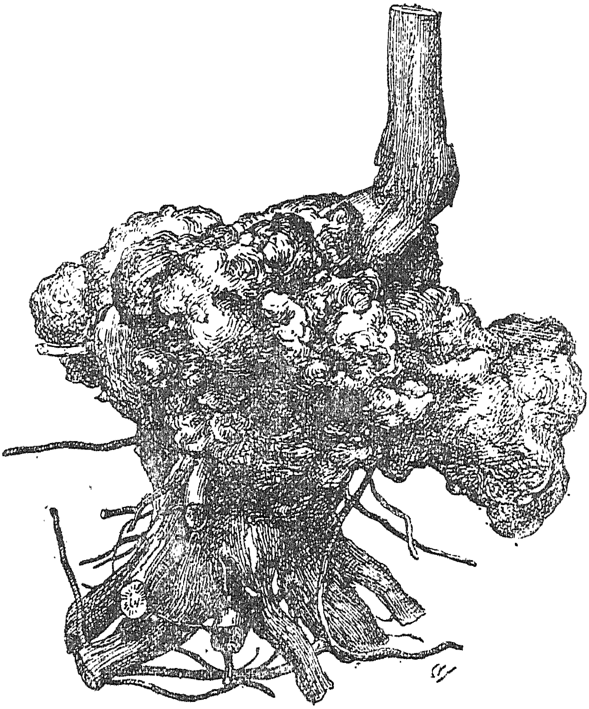
When oïdium is severe, and in case of emergency, the following formula will be found to answer well:—

Water	22 gallons.
Soft Soap	1lb.
Liver of Sulphur	1lb.

This treatment is not meant to replace sulphur, but to check oïdium on grapes. The liver of sulphur acts promptly by contact, whereas sulphur acts by emitting sulphur fumes, which may be checked by unfavourable weather. There are times when sulphur does not act as it should, because it is washed away by showers of rain, or because the temperature is too low for a sufficient emission of sulphurous acid gas. In such cases try liver of sulphur. Do not increase the dose, as liver of sulphur is corrosive, and soft soap may impart a nasty taste to the grapes.

Crown Gall of the grape (called "*Broussin*" in France) shows like large cancerous growths at the crown of the vine. A knock with the hoe or the plough, the bite of insects, sunscald, or a variety of causes will produce these unsightly growths. The treatment should be somewhat similar to that of cancer of the apple.

Remove the growth, trim the wound, and wash the place with an antiseptic wash, or paint it with some acid solution.



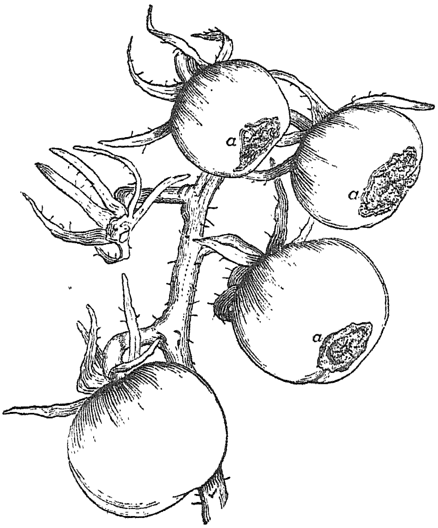
Crown Gall or *Broussin*.

SQUIRT BERRY *(Phoma tuberculata,* McAlp.).—This disease is at times troublesome, especially amongst the Muscats. The fruit is the part attacked; it is at first ashy grey or slaty blue in colour, dotted and speckled with numerous small pustules, for a long time covered by the outer skin or epidermis. When gently pressed between the finger and thumb the berry squirts out its contents. Towards the end of the season the berries dry partially, but are always pliable.

No experiments relating to preventive means have been tried, I have noticed, however, that vines trained alongside a fowl yard were much more severely attacked than others growing a short distance away. Manuring with potassic and phosphatic fertilisers, as well as liming, seems to lend to the vines greater power of resistance.

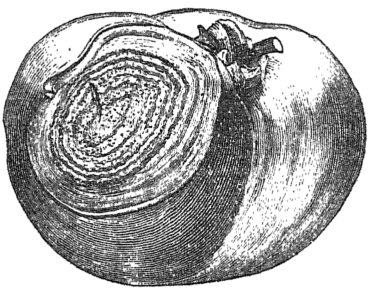
TOMATOES.

BLACK ROT (*Macrosporium Tomato*, Cooke). — The rotting of the nearly grown, or ripe tomato. Dull dark green spots of a velvety appearance show at first. These slowly enlarge, and the tomato rots entirely. The fungus is a wound parasite, gaining entrance into the ripening fruit through minute cracks. It feeds on the tissues under the skin, thus causing a little sinking below the surface of the healthy part of the fruit. Green stable manure is said to favour the disease, causing the fruit to crack. Bordeaux mixture keeps the disease in check.



Black Rot of the Tomato (*Macrosporium tomato.*) The rot seen at *a* the blossom end. The lowest tomato not yet attacked.—(*Agricultural Gazette*, New South Wales).

RIPE ROT (*Glœosporium fructigenum*, Berk.).—Commonly known as Ripe Rot, and often destructive to ripe apples, pears, peaches, and grapes. Concentric markings with no velvety appearance, as in the case of Black Rot, distinguish this disease, the skin remaining for some time glossy, though discoloured; the attacked area is flattened. When the pustules break out the spores give to the surface a granular appearance.



Ripe Rot (*Glœosporium fructigenum*, Berk.). *Agricultural Gazette*, New South Wales.

Preventive. — The small cherry and plum tomato are not attacked. Training the vine on stakes or trellis, so as to give the fruit plenty of light and air, is usually useful, as the Black Rot is more active in a damp atmosphere and near the ground. Burn diseased fruit and vines. Drain if necessary. Never use seeds from diseased tomatoes. Alternate crops.

Remedy.—Spray the young vines with Bordeaux mixture or sulphide of potassium, and then periodically every few weeks—especially the young fruit.

LEAF RUST (*Cladosporium fulvum*, Cooke).—This disease spreads with great rapidity. It is caused by a fungus which forms rusty brown patches on the under-side of the leaves. These patches consist of closely packed clusters of coloured conidiophores. As these patches spread the leaf becomes yellow and wilted, the margins curl, and the leaves shrivel and die. Bad drainage and moist situations favour the growth of the fungus, which requires plenty of moisture. Trellising, by lifting up the plants into a drier atmosphere, lessens the liability of attack. Spraying with Bordeaux mixture or with sulphide of potassium (liver of sulphur) will hold the disease in check.

TOMATO WILT.—This trouble is caused by two different agents, viz., a fungus (*Fusarium lycopersici, sacc.*) and a bacillus (*Bacillus Solanacearum*). The symptoms of both diseases are much alike. The first, which is known in the Channel Islands as the "sleeping disease," at times causes great damage. This disease is indicated by the drooping of the leaves, followed by that of the plant, hence the name given to it. If the plants are only attacked when the fruits are green, these ripen and there is nothing in their appearance to show that they are in any way infected. The fungus gains access to the plant through the rootlets and gradually extends to the tap root and lower portion of the stem. When it gets this far, a brown discoloration of the vascular bundles takes place, and the plant droops or "sleeps." Shortly after this stage, says Prosser, the portion of stem just above ground is more or less covered with a very delicate white mould which consists of fruiting branches or conidiophores, which bear conidia at the tips. These conidia fall to the ground and there germinate, producing a mycelium, which attacks the rootlets of tomatoes, potatoes, egg fruit, and plants of that family, owing to the mode of attack. Spraying with fungicides is of little use. Rotation of crops minimises the trouble, liming of the soil is recommended, and above all, seeds from fruit ripening on diseased plants should not be used.

The bacterial disease of the Solanaceæ is very similar to the previous one. The foliage first wilts, then the plant collapses—wilts and dies without sign of disease upon it. As the germs are in the circulation and not outside, no external treatment is of any avail. A section of a diseased branch discloses a brown discoloration of the woody cylinder, and from the vessels ooze out yellowish drops carrying the bacteria.

The disease is propagated by inoculation, generally by nibbling insects, whereas in the previous disease the fungus cannot be inoculated on the stem or the leaves, and only enters the plant through the rootlets. In the case of the bacterial disease, spray with Paris green to check leaf eating and leaf-puncturing insects.

Root up and burn all infected plants; do not plant solanaceous plants in quick rotation on the same ground.

Quite lately Delacroix has described an organism connected with the disease in question, to which the name *B. solannicola* is given. The organism is believed to be present in the soil, from which it spreads to the plants, and unfavourable meteorological conditions are said to aggravate the infection. Associated with it is a soil fungus, *Rhizoctonia solani*, which is an active parasite of the potato and the tomato plants.

BEE NOTES.

SEASONABLE HINTS.

After the heavy rains the end of July and beginning of this month it behoves those beekeepers who are using box hives, and also those having home-made hives with top covered with old bags, to examine and remove, or replace, as these will be sodden with wet; and as we may expect sharp, frosty nights, unless prompt measures are taken loss of bees will be the result.

Stocks that are weak should also be examined and packed as closely as possible, all extra frames removed, and only those frames that the bees can cover left in the hive. Neglect this and moths will very likely make short work of the lot.

Any short of stores should have syrup given to help and stimulate. Be careful only to feed in the evenings. Give the syrup warm.

Strong colonies, in the warmer parts of the State, will soon give signs of swarming, and where clipping the queen's wings is not practised, attention should be given to prevent swarms making tracks for pastures new. To prevent swarming, all Queen cells should be cut out that are found, and the colony closely overhauled every ninth day, and cells removed.

Extra hives should be in readiness where increase is desired, and when the swarm issues the old hive removed and replaced with an empty one, on the old stand. Place a frame of open brood, well in the centre as soon as a new swarm is hived; this will encourage; and also give, should the queen be lost or maimed, means at hand for them to raise another queen.

All Queen cells except one, and that the largest, should be removed from the hive from which the swarm has come, to prevent a second or after-swarm.

NOTE.—Strong, rousing swarms will always give good results at swarming or any other time.

Keep all stocks strong.

IN SEARCH FOR PARASITES.

Report by G. Compere.

The following very interesting report from Mr. G. Compere, who has just returned to this State after an extended tour round the world in search of parasites of some of our most serious insect pests, will be read with considerable interest by our many readers:—

The Director,—I herewith beg to submit the following report with reference to the search of the parasite of the Fruit Fly *(Ceratitis capitata)*, together with some notes made upon other insect pests and parasites during my recent mission to China, Japan, America, and the Mediterranean regions.

Acknowledgments.—Thanks are due to Dr. L. O. Howard, Chief of the Division of Entomology, and D. W. Coquillett, of the same division, for information furnished. Also to Professor Antonia Berlese, and his assistant, Professor Costantino Ribaga, Entomologists at the School of Agriculture, at Portici, Italy, who were able to furnish me with most valuable information concerning the destructive work of the Fruit Fly in that country. To Dr. P. Siepi, at Marseilles, France, as to its occurrence in the South of France. To the Officers of the P. & O. and O. & P. steamers, "Arcadia," and "Ormuz," for taking care of such parasites and predaceous insects as were intrusted to their keeping during their long voyage from Marseilles to Fremantle, and their safe delivery to the officers of the Department.

I left Perth, 2nd October, 1902, for Sydney, where I collected a few hundred lady-birds (*Chryptolaemus montrouzieri*) which feed upon the various species of mealy bugs: these were sent by post and arrived in splendid condition, and where liberated in some of the gardens in and around Perth. While in Sydney, I attended a conference, at which was present the Hon. Mr. Kidd, Minister of Mines and Agriculture of New South Wales; Hon. Frank Farnell, M.L.A., of New South Wales; Dr. N. A. Cobb, Pathologist; Mr. Froggatt, Entomoligst; and Mr. Campbell, Clerk of the Department. The conference had been arranged by Mr. Farnell, his object being to have that Government co-operate with this in the search of beneficial insects. At the request of Mr. Farnell, I had prepared a list of the insects which had once been serious pests in California and the Hawaiian Islands, and which had been reduced to harmless numbers by the introduction of parasites and predaceous forms. At the conclusion of the reading of that list, the Minister inquired of Mr. Froggatt, if he was prepared to dispute the correctness of the statements contained in the paper; his reply to the Minister was to the effect that it was correct, in so far as he knew, but showed his hostility to any method of handling insect pests except by Kerosene Emulsion or Fumigation, but had to acknowledge that if it were not for the presence of some indigenous parasites and predaceous insects in that State, there would be very little vegetation but what would be destroyed by some of the various species of mealy bugs which are known to exist in that State, but said that he had been trying to introduce parasites from South Africa and Hawaii to feed upon some of the orchard pests of that State, but they had all proven a failure, and also stated that he had sent some lady-birds from New South Wales to South Africa, which had never done any good in that country, and that the Government of India had, a few years ago, sent an agent to Australia, to collect lady-birds to destroy the pests of the coffee and tea plantations of India, and these also had proven a failure. That these failures occurred is not to be disputed, as it is just as Mr. Froggatt stated, and any one having the slightest knowledge of parasites and predaceous insects, knows that each have their own particular food scale or other insect, just the same as with those that are pests, they all have their favourite food plant, and some may attack and live upon many different plants, but will only thrive and flourish on one or two. The same insects which were intended to be destroyed in New South Wales, by the South African lady-birds, are also pests in the latter country, and are not indigenous to either Australia or South Africa; and it was the same with those sent to South Africa, not having their natural food to feed upon, they did not establish themselves. With those he mentioned as having been introduced from Hawaii, it so happened that I was present when Mr. Campbell asked Professor Koebele if he would be kind enough to send the parasite of the wax scale which he, Mr. Koebele, had discovered in Japan and introduced into the Hawaiian Islands, where it soon reduced the wax scale (*Cerop lastes rubens*) from a troublesome pest to a harmless one. Mr. Koebele promised to and did send them as soon as he returned to Honolulu. He placed the package containing them in the refrigerating room of the steamer "Alameda," in charge of Mr. Clark, who was at that time Chief Steward, the package was addressed to Mr. Froggatt, and Mr. Koebele wrote to Mr. Froggatt at the same time advising him of the sending, but during the two weeks that the "Alameda" lay in port at Sydney, and this, too, within 500 feet of Mr. Froggatt's office, the package was not called for; and on the day that the steamer was to leave Sydney on her return to San Francisco, I met Mr. Clark in the street in Sydney with the package in his hands, trying to find Mr. Froggatt, and complained about the carelessness in not calling for the package when Mr. Froggatt had been advised of its having been sent, and informed me that he would bring no more. The hawking of the package around in the hot sun after it had been packed on ice for two weeks, was enough to kill every parasite in the package, as they must be placed in a cool room for a day or two, and allowed to thaw out gradually before liberating. The next day, after Mr. Clark had delivered the package, I called upon Mr. Froggatt, and he informed me that he had placed the parasites on a tree in the Botanic Gardens, and covered the tree with a sheet. Anyone having any knowledge of insects should know that when insects find themselves imprisoned will often exhaust themselves in trying to make their escape. More than a year after these parasites had been handed to the Government Entomologist, I met Mr. Campbell, in the street in Sydney, and he complained to me that Mr. Koebele, had not kept his promise, I then informed him that he had sent the parasites as he agreed to do. However, that was the first Mr. Campbell had heard of their having been received, so much interest was taken in the matter that the fact of their having been received was never recorded.

With reference to the lady-birds that had been sent to India, it need only be mentioned that the agent sent out to collect them had no knowledge of parasites or predaceous insects, for amongst his collection of beneficial ones, he had also collected and forwarded to India some very destructive forms of *Coccinellidae*, which feed upon the foliage of plants, these have established themselves in that country, as they, no doubt, found their food plants there, while the others did not find their food scale and perished, as the female insects have instinct enough not to lay their eggs where there is not food for their young.

At the conclusion of the above-mentioned conference, the Minister, Mr. Kidd, instructed Dr. Cobb to write out a report favouring the idea and plan of Mr. Farnell, to co-operate with this Government in the matter. Dr. Cobb did write a favourable report, and sent it to Mr. Campbell, Clerk of the Department; but when Mr. Farnell, a few days later, called upon the Minister, Mr. Kidd, in the House for the papers, and the one written by Dr. Cobb was not produced then, or up to the time of my leaving Sydney for China, and has not up to this date, so far as I am aware of; but a lot of other papers, written by Mr. Froggatt or Mr. Campbell, were laid upon the table in the Legislative Assembly. These papers were prepared to mislead the Minister and others interested. I have only the newspaper accounts of their contents, and which were sent to me after I had left Australia, and have up to the present time no opportunity of placing before the public the false statements which those papers contained. The following is taken from the *Sydney Daily Telegraph*, 21st November, 1902:—

> Mr. Farnell continues to elicit from the Minister for Agriculture a good deal of more or less valuable information concerning fruit pests and their natural parasites. In the Legislative Assembly yesterday Mr. Kidd, in reply to questions by Mr. Farnell, said it was not a fact that none of the various parasites of *Icerya purchasii* were known in Australia until discovered by the Californian agents, who were sent here for that purpose. Frazer S. Crawford, of Adelaide, discovered the fly parasites *Lestophonus iceryae* and *Ophlesia Crawfordii*, and Skues, of the Australian Museum, a third species. Koebele, the Californian agent, did not get his lady-birds (*Vedalia cardinalis*) in Australia, but in Nelson, New Zealand, where he obtained 6,000 in three days. It was probable that the *Iceryae purchasii* scale was a native of this country. The parasite which killed it in Sydney was the fly parasite, not the lady-bird, which was its active enemy in New Zealand, the Cape, California, and other places. This coccid did sometimes appear as a pest on roses, creepers, and wattles in gardens, and a spray of

kerosene was most effective for destroying it when the parasite was wanting. The results of the visit to foreign countries of an expert on pests from the entomological division at Washington were not yet known. The Minister was still favourable to an experiment being made, if it could be carried out on satisfactory lines. With regard to the suggestion that he should take immediate steps to introduce legislation with a view to the extermination of pests by natural as opposed to artificial means, it did not seem to him that legislation was necessary when we had most of the useful beetles and parasites in this country. Proper inspection of nurseries and power to enter all neglected orchards, as was done in California, would do more to check orchard pests.

On November 20th, 1902, in the same paper, under the head of "Replies to Questions. Fruit Pests," the following appeared:—

Replying to Mr. Farnell, Mr. Kidd said that it was a fact that the white cottony scale, which had found its way into Calfornia, and caused millions of dollars' worth of damage to trees, had been reduced to a harmless insect by the introduction of the lady-bird beetle. *Lestophomous and ophlesia* were of no value abroad, as they would not travel, and were invested with a secondary parasite. The soft brown scale, *Lecanium hesperidum,* was never a pest in Australia, and was not a pest in America. The brown apricot scale, *Lecanium armenicum,* was also unknown as a pest here, and was not recorded as a pest in California. San José scale was still a pest in California, and lime, salt, and sulphur wash had been regularly used, and was still used, where fumigation had not taken its place, in all the best orchards. None of the *Dactylopius* caused any damage in Australia, or anywhere else where there were lady-bird beetles. There was no record of the cabbage butterfly being a serious pest in California, and the parasite *Pteromalus puparum,* common all over the world, was a parasite upon our common black orange butterfly here. Nearly all the parasites mentioned were natives of the United States, and had been accidentally introduced into California with the fruit trees and scale insects.

To the first statement that "it was not a fact that the *Icerya* parasites were known in Australia until discovered by the Californian agent:" It is a matter of record that there never was any parasites of *Icerya* known in Australia until Mr. Koebele, the Californian agent, recorded them. That some of these parasites were known and named long before Mr. Koebele ever visited Australia is correct, but they were only known as Museum specimens, and their value was unknown. This can be proved by looking over the correspondence which took place between the American entomologists and those of Australia and New Zealand, before Mr. Koebele arrived in Australia, as not one knew of the existence of any parasite of *Icerya.*

To the second statement that "Koebele did not obtain his ladybirds, *Vedalia cardinalis,* in Australia, is untrue, and no one knows it better than the man that furnished the Minister, Mr. Kidd, with it." The facts are that Nelson, New Zealand, received their *Vedalia* beetles from California after they cleaned up the *Icerya* in that country. The New Zealand people were unable to obtain them from Australia, for the reason that the Australian entomologists did not know them at that time, and the present entomologist of New South Wales does not know it at the present time, as is shown by himself, for in the September number, 1902, of the *Agricultural Gazette,* he gives a coloured plate of Australian lady-birds, and his

No. 15, which he calls *Vedalis* or *Novius cardinalis*, is another beetle altogether, and in writing of what he calls *Novius cardinalis* he says that he has collected it in all the States, and the only occasion when he had seen it feeding upon anything but *Icerya* was quite recently. Yet he informed his Minister that it did not kill the *Icerya* in Sydney.

3rd. That the parasite flies "*Lestophonus and Ophlesia,* were of no value abroad, as they could not travel and were invested with a secondary parasite," is one of the most ridiculous statements that could have been made, as both of them have wings, and can fly the same as any other fly or wasp, and spread from one end of the State of California to the other after having been introduced there. With reference to the secondary parasites which these two are invested with, this is true with all insects, beneficial or otherwise, but the California agents were not so stupid as to send the secondary forms along.

4th. "That the results of the visit to foreign countries of an expert on pests from the entomological division at Washington, were not yet known," is not a fact, for the division did not send out any expert to foreign countries to collect parasites, and never have, as that department is very lukewarm upon the question of fighting pests by the introduction of their natural enemies, as the idea did not originate with them, and Mr. Koebele was sent out against the wishes of the Chief of the Division at that time, Mr. Riley. Mr. Koebele was sent by the direction of the Secretary of Agriculture, at the request of the State Board of Horticulture of California, and this only after the California Commissioner to the Melbourne Exhibition, Mr. McCoppin, had agreed to defray his expenses. Mr. C. L. Marlatt, a couple of years ago, whilst on a pleasure trip round the world, and while in Japan made some collections, and among them a lady-bird that was found feeding upon the San José scale.

5th. "No one, to my knowledge, ever claimed that the soft brown scale was a pest in Australia, but it was once serious in California, and has been reduced to a harmless form by its parasite."

6th. "Brown apricot scale *Lecanium armenieum* was unknown in Australia," is true; but the statement that it had never been recorded as a pest in California is a false one, as it has many times been recorded as such, but this, too, has been reduced to a harmless species by its parasites.

7th. "San José scale is still a pest in California." This is also an untrue statement. To show to the public how cunning the kerosene entomologists are to belie the work of parasites in California, I will quote from Professor C. W. Woodworth, Entomologist of the University of California; he belongs to the kerosene school of entomologists. At a meeting of the Association of Economic Entomologists, held at New York City, June 22 and 23, 1900, in speaking of the San José scale, he says in part: "The San José scale (*Aspidiotuç preniciosus*) is still with us in California, but is so well in control that it is scarcely ever mentioned when discussing injurious insects in conventions of meetings of farmers. The use of the lime, salt, and sulphur mixture is so beneficial to the tree that it is often used when the orchard is free from pests." (Bulletin No. 26, new series, U.S. Department of Agriculture, page 92.)

Mr. Woodworth does not say that the lime and salt mixture was the cause of scale being so well under control, but anyone not acquainted with the facts would conclude it was from the way he spoke. Two years later (in the Eight Biennial Report, State Board of Horticulture, Cal., page 349) this same Mr. Woodworth, is reported as speaking at a California fruit-growers' convention, held in San Francisco, says among other things: "The San José scale, the peach worm, the vine hopper, the red spider, the canker worm, indeed nearly all of the most injurious insects of the State find the conditions at Berkley uncongenial to them. In fact, there is no injurious insect that is troublesome over the whole State, and very few that are not remarkably local." It must be remembered that Berkley, where the University is situated, is in Alameda County. Mr. Woodworth did not have a word to say about parasites having cleaned the scale pests out of Alameda county. But the following clipping from the *Niles Herald*, Alameda County, Cal., January 1903, will show what has made the conditions at Berkley uncongenial to the insect pests:—

INSECTS SAVE SPRAYING.

Immense Savings to Orchardists through work of Imported Bugs.

The following interesting report on the work of beneficial insects in saving time, labour, and money in spraying orchards to keep the fruit clean was presented to the Supervisors Monday:

GENTLEMEN,—In this, my annual report, I will endeavour to give an estimate of the horticultural interests and the extent of the fruit industry in this part of Alameda county.

The new internal parasite of the black scale (*Scutellista cyanea*), lately imported by the State Board of Horticulture from South Africa, bids fair to be one of the most valuable insects introduced into California. Last April I received from Mr. Craw, state quarantine officer, about 30 of these insects and placed them in the orange grove and olives of H. A. Mayhew of Niles, and on the 18th of September I cut enough twigs to fill four two-quart jars, from which I hatched out 149 parasites. These I placed in different localities in Washington township, and at Sunol in Murray township. I hope they will give enough increase to commence placing them in deciduous orchards the coming year.

There has not been any spraying done in this district since 1893, and it is a singular fact that no estimate in the saving in dollars and cents has been made during the past nine years. Upon a suggestion made to me I consulted some of the leading orchardists as to what they considered the cost of spraying was at the time it was practised. My estimate being much lower than theirs, I give it, as follows:—

There are 1,996 acres of commercial orchards in the district—not counting orchards of less than five acres—I deduct 400 acres for cherries and almonds, leaving 1,596 acres, and I find the saving—for labour and material alone—to be $19,152 per year, or a total of $172,368 for nine years. This is quite a neat sum to be placed to the credit of the beneficial insects.

In the above estimate no consideration is taken of the orange and lemon groves, nor of the thousands of olive and ornamental trees in the district, or the money spent in futile efforts to keep them clean. Even now it takes close application with the assistance of the beneficial insects to keep the trees and fruit in their present clean condition. Before the introduction of the insects it cost Mr. McIvor of Mission San José $800 a year in his attempt to keep the scale in subjection on his orange, lemon, olive, and ornamental trees. Now they are bright and clean without cost. William Barry, horticultural commissioner of Alameda country.

8th. None of the *Dactylopious* caused any damage in Australia. No one ever claimed that they did, for the very reason that they are held in check by their natural enemies, which Mr. Froggatt admitted to his Minister. But some species of *Dactylopious* had at one time caused the destruction of thousands of tons of sugar cane annually, and have by the introduction of their natural enemies to the Hawaiian Islands become harmless.

That there were no records of the cabbage butterfly being a serious pest in California, is also untrue, for *Pieris rapæ* had been recorded as a serious pest in that State as far back as 1870, but is now no longer looked upon as one, having been reduced to a harmless state by parasites.

9th. Nearly all the parasites mentioned were natives of the United States, and had been accidentally introduced into California with fruit trees and scale insects. This statement is just as false as the others mentioned, and was made with the intention of belieing the work of the California agents who have for years past been sending beneficial insects into that State, and also to cover up the ignorance of the persons making them.

I should not have taken any notice of the above-mentioned questions and replies, which took place in the Legislative Assembly of New South Wales, had they not been made a public record; and in connection with my recent mission in search of the parasite of the fruit fly, and as the questions asked by Mr. Farnell were founded mainly upon information furnished by me, it is only right and just to both Mr. Farnell and the Hon. Minister, Mr. Kidd, to correct the false statements furnished to them after I had left the country.

I sailed from Sydney for Manilla, Philippine Islands, November 6th; but on my arrival there, found the cholera raging in those islands, and could not land, and proceeded on to Hong Kong, China. My object in visiting the Philippine Islands was to search for the fruit fly, for, on a former visit to those islands, while travelling for California, but not interested in fruit fly parasites at that time, a specimen of fruit fly was noticed in one of the public parks at Manilla one morning while in search of other insects. Being unable at the time to capture the specimen, it escaped. It may or may not be the same species as we have here, and nothing short of a thorough search of the islands will decide.

Eighteen days were spent in China, with headquarters at Hong Kong, from where side trips were made to Canton and Amoy.

During that time three new species of fruit fly were discovered. The maggots were feeding in wild fruits (*Solanum album*) and *Solanum æthiopicum*. At least *one* of these species of flies will attack pears, as one female fly was placed in a glass jar containing a pear which she attacked, and before leaving Hong Kong the maggots were about one-third grown; seven were counted. Not wishing to take the chance of introducing them into some of the countries which I was about to visit, they were destroyed. Upon one of these species of fruit fly a parasite was discovered (an Ichneumon fly). This little parasite could be noticed flying from fruit to fruit in search of punctures made by the fruit fly, and when a puncture was discovered she would immediately place her ovipositor in the same and deposit her eggs among the young maggots of the fruit fly. From one of these fruits in which the parasite had deposited her egg a single parasite was reared; this would indicate that only one egg was laid.

From information furnished by Europeans residing in China, it was learned that occasionally a fruit of the Kaki, or Chinese date plum, or commonly called persimmon, would be found containing maggots, but none had ever made any attempt to learn what species of insect they were the larvæ of, and during my stay I found none in any of the persimmons examined. It was also learned that the celebrated Chinese nut *Nephelium Litchi* is sometimes found infested with maggots. These nuts, when fresh, are filled with a white, almost transparent, sweet, jelly-like pulp. There are about twenty-five species of these fruits, commonly called nuts, all natives of Southern Asia and the Indian Archipelago, excepting a single species which is found at the Fiji Islands. These fruits are just such as would be attacked by the species of fly we have here, and the so-called Queensland form. There being no fruit upon the trees at the time of my visit, I could not determine what species it was that attacked the lichi fruit in China.

While in China, a search for the red scale *(Aspidiotus aurantii)* was made, and during my stay there not a half-dozen specimens of that scale was met with which had not already been killed by parasites. These few specimens were sent to this State; but, as there were so few, and some of the parasites hatched before arriving, it is not likely that they will become established from that sending. The black scale *(Lecanium oleæ)* was met with, infesting a species *(Aristolochia)* growing in a swamp along the Canton River. This was the first time this scale had ever been recorded as occurring in that country; there it was found to be very heavily parasitised, and no less than three different species of parasites were reared. In no instance was even a single specimen of this scale noticed upon any domestic plant or tree. Two different sendings of material from which to breed parasites were sent by post to this State, but these arrived in very poor condition; there was no opportunity of placing them in the ice-room of a steamer.

The so-called Florida red scale (*Aspidiotus ficus*), which is a very serious pest of the citrus trees in some parts of the world, was also met with while in China; very few living specimens were to be noticed, however. It also being heavily parasitised. A few living specimens of this scale was found upon a small pot palm tree, and this I carried to San Francisco, and handed it to Mr. Alexander Craw, of the California State Board of Horticulture. As this scale does not occur in this State, none were sent here. This scale is a serious pest in Queensland, and may reach this State at any time, so it will be known where its parasite may be obtained. The same with the so-called white louse (*Chionaspis citri*); a single orange tree in nursery row was noticed infested by this scale, and nearly every one containing a small hole in the back. This is also a very troublesome pest in New South Wales, and may reach this State at any time.

The next place to visit was Japan, but during my stay there it was raining, and nothing could be done. Leaving there for California, where I arrived on 20th January. While in San Francisco, Mr. Alexander Craw, Entomologist of the State Board of Horticulture, promised that he would send to this State any parasites which were to be had in that State, and it had been my intention to secure while there some of the red scale parasites which they had reared from those sent from China two years before, but was informed that the orange grove in which he had liberated them had been cut out and burned, and this after the owner had promised not to spray or fumigate the trees in order to give the little parasites a chance to become established. The owner could give no reason for having destroyed the trees, only that he had not promised not to do so. However, Mr. Craw was breeding some more in his office which he was going to liberate in some other infested districts. The establishing of this parasite in California will mean the closing up of some hydrocyanic gas and kerosene emulsion shops. Should we be unable to secure this parasite direct from China, we will be able to get it from California, as soon as it has become established. The San José scale is no longer a pest in that State, being held in complete subjection by the little parasite *Aphelimus fuscipennis*. In Madeira county the scale had obtained a strong foothold before its presence was discovered.

The only orchards in those States which are now troubled with black scale (*Lecanium oleæ*) are those that would not listen to the advice of the State board a few years ago to let the parasites do the work of destroying it, instead of fumigation and spraying. The so-called South African parasite *Scute llista cyanea* has become well established in that State; this alone will rid that State in the future of black scale. It is a remarkable fact that this valuable little parasite was not noticed years ago, as it has held this scale in subjection in Europe for more than a century. Mr. Tom Hooper, of this department, on his return from England last year, *via* South Africa, was furnished with some of the parasites by Mr. Lounsbury, Government Entomologist of Cape of Good Hope. Unfortunately these perished before they could be liberated. However some more are soon expected to arrive from that country. If we fail there we can have them sent from California.

The brown apricot scale (*Lecanium armeniacum*), once a serious pest in California, is now a harmless form there; the yellow scale (*Aspidiotus citrinus*), also a serious pest of the citrus orchards in that State at one time; the soft brown scale (*Lecanium hesperidum*), also a troublesome pest once in that State; the various species of (*Dactylopius*) and cabbage butterfly (*Pieris rapæ*) are all held in complete subjection by their parasites there.

The most serious problem with which the California fruit-growers have now to contend is that of labour. Last season a great deal of fruit was lost for the want of labour to gather it in time for canning.

Leaving California, the next place to stop at was Washington, D.C. There Dr. L. O. Howard, Chief of the Division of Entomology, and C. L. Marlatt, D. W. Coquillet, assistants, were consulted with reference to the fruit fly, as to what information they might have concerning its occurrence in foreign countries. All the information which they had gathered concerning it had been published, and had already been furnished us, excepting as to its occurrence in Sao Paulo, Brazil. Mr. Coquillet was able to furnish me with the name and address of the person that had about two years previously sent to the department a specimen of fruit fly for identification, No. 575; this was identified as *Ceratitis capitata*, the same as we have in this State. This specimen was among a lot of other insect specimens sent to the department for the same purpose, and it was requested that this specimen, No. 575, be returned. The sender was Dr. H. Von Ihering, Caia Do Carreio, Sao Paulo, Brazil, who stated he had reared the specimen from a maggot taken from an orange. From that information it might be inferred that the species is a very uncommon one there, or that it may have been taken from an orange that came from some other part of the world. However I at once addressed the following letter to Dr. Von Ihering, to which there has as yet been no reply :—

New York, 9th March, 1903.

Dr. H. Von Ihering, Caixa Do Carreio, Sao Paulo, Brazil.

Dear Sir,—While in Washington the other day, I was informed by Dr. L. O. Howard, chief of the division of entomology, that you had about two years ago sent specimens of a species of fruit fly to him for identification No. 575. This was identified as *Ceratitis capitata*.

Being very much interested at the present time in securing information about this particular species of fly, I have taken the liberty of addressing you upon the subject. The information wanted is how long has this fly been known to exist in your country? What fruit has it been found to attack? And is it considered a serious pest there, as it is in other countries, where it has become established? If so, what methods are employed to check it? Any other information which you may be able to furnish with reference to its habits there will be highly appreciated by myself and the Government of Western Australia. This fly has become a very serious pest in some of the Australian States, and I am now on my way to the Mediterranean region to see by what method it is handled there. Thanking you in advance for your kindness,

I remain, very respectfully,

GEO. COMPERE.

Address letter c/o Department of Agriculture,
Perth, Western Australia.

March 11th.—I left the United States for Spain, *via* London and Marseilles, arriving at Barcelona 28th March. In that province very few peaches are now grown, owing to the ravages of the fruit fly, and that market is now being supplied with peaches from Minorca, Majorca, and other Balearic Islands. The oranges are seldom attacked there by the fly, at least not to any great extent, and this only in the late varieties. Another species of fly *(Dacus oleæ)* is also a serious pest in that, as all of the other olive-growing districts of the Mediterranean regions, destroying annually more than one-half of the olives in those regions. This is no doubt also a tropical species, and carried there a hundred or more years ago, as it has been known there for nearly a century.

In the large olive-growing districts of Cambrilis, Ametila, Amposta, Tortosa, and Torreblanca there are thousands of acres planted with olives, and some seasons the crop is so much destroyed by the fly that the balance is scarcely worth gathering.

The citrus trees in and around Barcelona are very badly infested with *Mytlaspis citricola* and *Mytilaspis gloveri*, but not a single specimen of *Lecanium oleæ* was noticed, and only very few scattered specimens of it were found on the olives, and these all contained holes in their backs, with one or two exceptions; and during two days' collection not enough living specimens were secured to breed parasites from for sending; it was the same in all sections visited in Spain. *Scutellista cyanæ*, the so-called South African species, is responsible for this. None of the growers could remember the black scale ever having been a pest there.

Castellon, Villarreal, Burriana, Nules, Almerna, Los Valles, Sagunto, Albuixecon, Carcagenta, and Puebal Larga are the largest orange-growing districts in Spain, and are situated in the Valencia Province. In these districts the fly seldom attacks any but the late varieties of oranges. But the peach, nectarine, and apricots are no longer cultivated in those districts, owing to the ravages of the fly (*Ceratitis capitata*), and in the garden connected with one of the old churches at Carcagenta was shown some old peach and nectarine trees, under which the seeds were piled up to a depth of several inches, just where they had fallen from the trees for years, and the old priest in charge informed me that not a single fruit on those trees escaped the attention of the fly, and also he could well remember the time, when a boy, when the peaches were free from any maggots in that country. From the soil beneath those trees any number of pupa of the fly could be obtained, and none produced any parasites. At Malga the fly was reared from maggots taken from the prickly pear fruit, and I was informed that it was a serious pest of the bitter Seville oranges, extensively cultivated in that province for marmalade making for the London market. The bitter oranges having all been gathered, I was unable to secure any specimens from that fruit. But, from information obtained from some of the growers, I am inclined to think that it is another species which attacks the bitter oranges. At Seville, there were large numbers of the bitter orange trees loaded down with fruit, and not a single fruit was found attacked by the fly; these trees were growing in one of the large public parks, and the caretaker informed me that he had never noticed any fruit containing maggots, but often found the loquat or Malta plums containing maggots. From some of the commission merchants at Seville it was learned that the fly was extending farther inland to the north every season, and often whole consignments of peach or nectarines would have to be discarded owing to their being so badly infested with the fruit fly maggots.

At Cadiz it is also a serious peach pest, and some fruit merchants no longer care to handle peaches, owing to their being so badly infected with maggots. Finding that there was nothing to be gained in continuing the search in Spain for any parasite of this fly, my attention was then directed to that of the codlin moth (*Carpocapsa pomonella*). This resulted in the discovery of no less than eight different species of parasites which destroy this moth, and one species in particular, if properly introduced into a new country infested with the moth, leaving behind the secondary form, it would soon bring the moth into subjection. To watch the performance of this *Ichneumon* fly in her search over the stem of an apple tree for the hiding place of a codlin moth larvæ: when one was located, she would at once elevate her long ovipositor in a loop over her back, with its tip on the bark directly over the place where the moth larvæ or pupa would be located, and as soon as the opening by which the larvæ had entered was found, she would then make a derick out of her body, and with great skill would proceed to search for the moth grub with her long ovipositor, and as soon as it would come in contact with one, she would immediately deposit her egg in the pupa or grub of the moth. In one instance a grub, when it found it was being attacked, made a hasty exit from beneath the bark, and proceeded to crawl up the stem of the tree, but before it had proceeded more than an inch was discovered by the *Ichneumon*, when she at once changed her position and attacked the naked grub, in which an egg was deposited. This grub was placed in a breeding tube, where it at once assumed the chrysalis form, and from this was reared a parasite.

In some sections of Spain another species of moth was noticed to infest apples much the same as the codlin moth; this also had its parasites present.

While at Valencia, two species of parasites of the destructive grain moth (*Gelechia cerealella*) were secured; some of these reached this State alive and were liberated. There were also secured in Spain specimens of a lady-bird which destroys the mealy bug

(*Dactylopius citri*); these reached this State alive, and are at the present time breeding in a breeding-jar in the office. There were also two other species of lady-birds secured, which were found feeding upon various species of scale insects; these also reached here alive and were liberated in orchards. Another species of lady-bird (*Coccinella septempunctata*), which may prove of great value to the State, was noticed feeding upon various species of aphis in all sections of the Mediterranean regions visited; these reached the State in splendid condition and were liberated.

There was another species of lady-bird noticed in Spain, feeding upon the red spider, but not enough for sending were to be found at the time.

Leaving Spain, the next place to visit was the South of France, and while at Marseilles I called upon Dr. Siepi, who kindly furnished me with information concerning the occurrence of the fruit fly in that section. Very few peaches or fruits which this fly attacks are grown in that part of France, they drawing their supply of such fruits mostly from the Balearic Islands. The gardens around Marseilles are all small, and none contain many trees other than olives; the fruit of the latter there, the same as in Spain, destroyed to a great extent by *Dacus oleæ*—the olive fly. Our species (*Ceratitis capitata*) does not occur in the Alpes Maritimes. My attention, while in France, was given to finding the parasite of the grape scale (*Lecanium cymbiform*), which had found its way into this State a few years ago, and established itself in the gardens in and around Perth. This scale is a native of France, but in that country it is seldom met with, being held in check by two species of parasites, the *Ichneumon* and the *Chalcid* fly. As many as eight maggots of the latter were found under a single scale, and three and four of the former. All the live specimens of this lecanium that were met with were sent to this State, from which a large number of parasites have been reared and liberated in gardens infested with this scale.

The next place to visit after leaving France was Italy. Going almost direct to Naples, stopping only two days at Genoa, and as it was raining during those two days very little was accomplished in prospecting for insects. Reaching Naples, no time was lost in calling upon Professor Antonio Berlese, at the School of Agriculture at Portici. When my mission was made known to him, he at once informed me that we were in the wrong part of the world to find any parasite of the fruit fly (*Ceratitis capitata*), as he had during the past two seasons secured pupa from various sections of the Mediterranean country, and in no instance were any parasites reared, and showed that it would be useless to visit Sicily on that account, as the fly was the same pest there as in the other sections where it had become established. It might be mentioned that both Professor Berlese and his chief assistant, Professor Costantino Ribago, have given up the old method of fighting insects with artificial methods, and have joined California, Hawaii, and Western Australia to fight them with their natural enemies. Professor Berlese has at the present time one of the best equipped establishments for the breeding of parasites that I have yet seen, and has taken up the matter in a systematic form, by requesting his Government to furnish him with funds to be able to secure parasites from foreign countries, but he complained that this was no sooner done than some of the leading entomologists of Europe began to throw cold water on his plans, but could give no reasons for doing so. Mr. Berlese requested me to send him some beneficial insects from this State, and he would reciprocate by sending us any that we might want from Italy. The olive fly (*Dacus oleæ*) is, without question, the most serious pest in Italy at the present time, as the cultivation of the olive is one of the leading industries. The peach scale (*Diaspis amygdali*) is also a very troublesome pest in that country to both peach and mulberry trees.

There are a large number of insect pests in Spain, France, and Italy, as well as China, of which no mention has been made in this report, but which will be mentioned in some future numbers of the Journal of the Department; I will also publish the names of parasites secured, as soon as they have been obtained.

Before concluding this report, I wish to express my sincere thanks to the officers of the department for the interest taken in this work, and for caring for and liberating the beneficial insects sent to this State.

REPORT ON THE CHAPMAN EXPERIMENTAL FARM.

By Alex. Crawford.

As requested I have the honour to submit a report on the Chapman Experimental Farm, giving the disbursements up to date, an approximate estimate of the value of the present crop at harvest, and what I may expect from the stock on the place; also an estimate of the expenditure for the next 12 months.

Sheet A.—*Buildings* you have seen. In these I have kept the expenditure down to the lowest ebb, and put up such as any farmer might put up for himself.

Fencing is a large item. The cost has been greatly increased by putting the droppers in, but the result is a thoroughly stock-proof fence, and even the goats cannot get through it.

Water has been an expensive item, out of four wells and three bores only one being fresh enough to use for domestic purposes and a second that sheep will drink, but not other stock. By the use of piping I could make the good well supply two paddocks, and it would be much cheaper than well-sinking.

Clearing and Ringbarking.—About 200 acres are cleared and about 200 ring-barked, and on about 400 acres the fallen dead wood has been burnt off.

Wages.—This includes the two men who did ploughing, sowing, etc., and who I have as permanent hands, also casual labour picking up roots, watering stock, carting goods from station, and other odds and ends.

Implements.—I have only got what was absolutely needed up to the present, but will want more before harvest. These cost a lot of money but they save it in labour.

Feed.—A very heavy item. I got the stock, thinking that there would be no difficulty about water, as on the other side of the river, only a few hundred yards off, all the wells are absolutely fresh. There was also a difficulty getting men to fence, in reply to advertisements. No tenders for fencing were put in, meantime the squatter stocked the country heavily and ate down all the feed. These difficulties could scarcely have been foreseen.

Seed.—Also a heavy item, but the price of grain this season was abnormal owing to the drought in the Eastern States. I could not get a supply of pure seed in this State and had to get it from South Australia, and it cost nearly 10s. per bushel landed on the farm. Ordinary dirty wheat was selling locally at 8s. per bushel.

Manures are also heavy, but I wanted to carry out a series of tests to see which was best suited to the district.

Stock.—All the stock I have are good, and should prove very remunerative as the young stock should command good prices.

Railway Freights ran into a lot of money, as did likewise cartage on wire and fencing material before I got the horses.

The House is so built that, if necessary, at an outlay of about £60, four additional rooms can be added, making 12 rooms in all.

Sheet B.—*Estimated Return.* This is rather difficult so early in the season. The average wheat crops, I am told, on the farms round about for some years past has been 18 bushels per acre. I have worked my return out at 15 bushels. As to price this year *Wheat* has been selling up to 8s. per bushel, but with the promise of good crops in the Eastern States, I think wheat will be cheap, and have worked it out at 3s. 6d. per bushel.

Potatoes are said to go from four to five tons per acre. I shall put it down at three tons, and the price at £5, about half last season's price. The market may be better, but I thought it better to estimate at low prices.

Sheep.—The sheep are in good condition, and well woolled, and ought to cut six pounds of wool, and as it is clean and free from sand it ought to bring 9d. per lb.

Lambs.—From 150 ewes I am counting on at least 100 lambs, and these, sold as fat lambs, should bring at least 12s. per head.

There are *six stud Shropshire Ewes,* from which I am counting on five lambs, and as the ewes are pedigreed and the lambs by the Melbourne champion ram, they ought to be worth at least £5 5s. each.

Cattle.—There are three young bulls that can be disposed of, and should bring £10 each. I have had a number of inquiries already about them, and do not expect to have any difficulty in disposing of them. If I had a dozen heifers I could sell them all.

SHEET C.—A *strong light Buggy* to run to the station quickly is needed, and will be more so when visitors begin to come. A number of the other implements it would be possible to do without, but they are all useful on a farm properly equipped for mixed farming, more especially when there are students on it, as with the high price of labour now labour-saving machines should be used as much as possible.

The Galvanised Iron is needed for sheds for the machinery, cows, chaff-cutting, and blacksmith's shop.

Pigs.—I have none. Feed was so dear that I thought it better to wait until I grew it, so as soon as harvest is over I will be ready for some.

Cattle.—I want about four more cows to make it worth while to dairy, as with only the four I have now it would scarcely pay for the time.

The cattle should also be very profitable, as in many parts of the State, especially in the South-West, there is a good demand for Dexters.

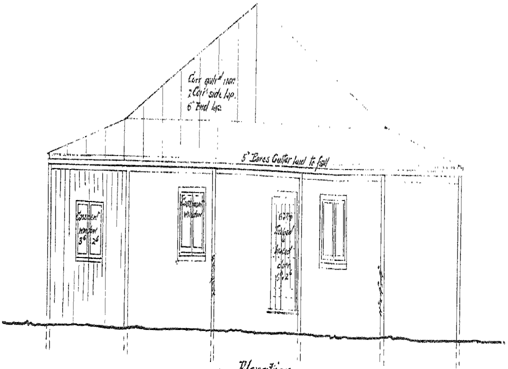
Stallion Fees.—Not having a stallion I will have to send the mares out, and the cost will be £3 3s. each.

Piping and Taps.—There is no water in the next paddock to the one with the well, and the cheapest way to get water would be to run a $\frac{3}{4}$in. pipe from the present well into it.

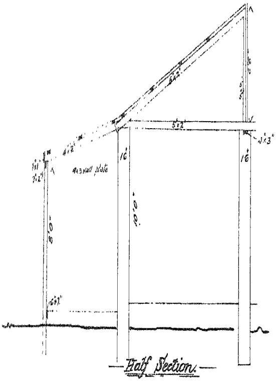
Bedding, Crockery, etc. is badly wanted at once. There were two visitors out this week from Kalgoorlie, and they had to be sent on to Jupp's.

Members of the following Farmers' Associations—Northampton, Upper Chapman, East Chapman, Greenough, and Dongara, have either written or informed me that they are coming up to inspect the farm, and at present there is no accommodation at all.

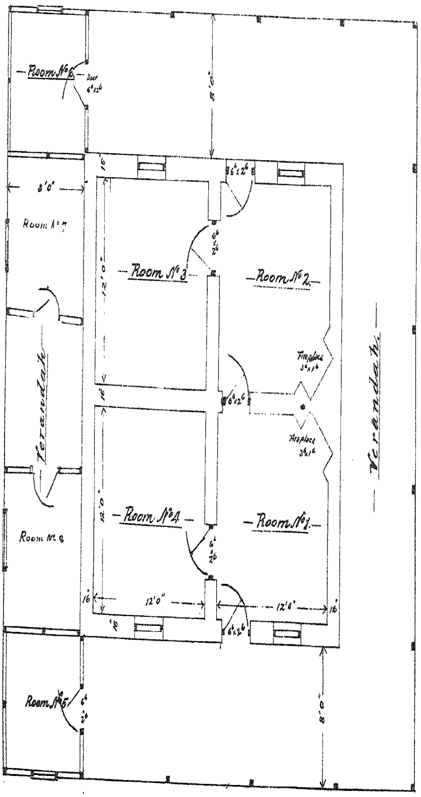
I made out an estimate of £1,197 7s. for the coming year, but I would like to have £1,400 or £1,500, so as not to be tied to that sum, as on a farm it is difficult to foresee what may be wanted; and after this season, the first, I have no doubt that, if worked as I would like to work it, it would be more than self-supporting.

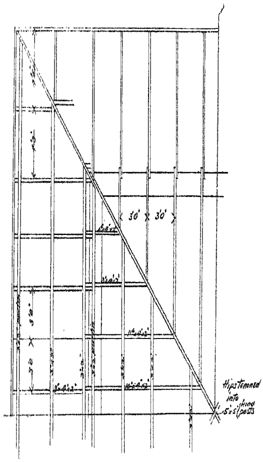


—Elevation.—



—Half Section.—





—Plan of ½ Roof.—

—Design for a Farmer's Residence—

—Chapman Experimental Farm.—

—Scale 4 feet = 1 inch—

H. J. Pether, Government Photolithographer, Perth, W.A.

P.S.—Under separate cover I am sending you a plan of the farm, showing situation of house, sheds, wells, fences, and the various plots of grain, etc., that are in. Also a plan of the house.

Since making out the estimates, I find that I put nothing down for timber for sheds. I would also like to purchase some common goats to cross with the Angoras for mutton for the farm.

The Agricultural Society here wishes to have an exhibit of stock, etc., from the farm.

I would therefore like to add to the estimates £50:—

	£	s.	d.
Timber	20	0	0
Goats	20	0	0
Geraldton Show	10	0	0
	£50	0	0

A

CHAPMAN EXPERIMENTAL FARM.

Amounts paid to 20th July, 1903.

	£	s.	d.
Buildings—8-roomed house, shed 30ft. x 30ft., stable 56ft. x 13ft., and stockyard	438	10	0
Fencing—16 miles, seven wires (one barb), three anchor droppers to panel on boundaries, and two miles cyclone ...	429	6	9
Tools—farm, blacksmith, carpenter, and pipes	35	13	5
Water—four wells, troughing, windmill, piping, pump, etc. ...	249	1	7
Petty cash expenses—stationery, casks, man, odd jobs, etc. ...	9	6	3
Land—clearing, ringing, and burning off...	273	19	6
Wages	210	7	5
Implements	227	4	1
Feed	248	15	4
Wear and tear, sundries, advertising, cartage, oil, embrocation, shoes, etc.	45	13	7
Harness, including repairs	31	15	6
Seed—wheat, oats, barley, rye, potatoes, rape, etc.	141	0	4
Manures—superphosphate, Thomas' phosphate, guano, potash sulphur, and potato	75	17	2
Stock—horses, cattle, sheep, goats, poultry, and bees	389	9	3
	£2,806	0	2

Of the above amount £86 0s. 9d. has been paid in railway freights; cartage, £61 7s. 4d.; total. £174 8s. 1d., on account of distance from Perth and railway station.

The seed cost £2 per ton above market price to have it delivered, or £40 12s. 6d. for delivery. This was charged on to cost of feed, and not included in the item of cartage, £61 7s. 4d.

I have an account in hand from Messrs. Sandover & Co., not paid, for £56. I have sent in a claim for an allowance for damages, owing to their neglect to advise me of goods not having been sent forward. There is about £100 still to be paid for outstanding accounts.

B.

CHAPMAN EXPERIMENTAL FARM.

Estimated Return for Year ending 31st December, 1903.

	£	s.	d.
170 acres grain, 2,500 bushels, at 3s. 6d.	437	10	0
6 „ potatoes, 18 tons, at £5	90	0	0
10 „ peas, 7 tons, at £7	49	0	0
Wool from 158 sheep, 6lbs. each—948lbs. at 9d.	35	11	0
100 lambs, at 12s.	60	0	0
5 stud Shropshire lambs, at £5 5s.	26	5	0
3 Dexter Kerry yearling bulls, at £10	30	0	0
Total	£728	6	0

I have allowed nothing for poultry, as probably all reared will be wanted on farm.

Out of the above estimate the cost of keeping the horses should be deducted, say, £100.

The suitable grain would be sold for seed, the rest consumed on the place by pigs, etc., and these sold, so that the returns should come out rather better than the above.

Wheat is now selling at 7s. 6d. per bushel; but as the price will probably be low next season, I have only put it at 3s. 6d. per bushel, and potatoes at £5, just half what they are now.

I have only allowed for 66⅔ per cent. of lambs. I will be disappointed if they do not turn out better than that.

C.

Estimate of requirements for next 12 Months, approximate.

	£	s.	d.
PLANT:—			
Strong light buggy, to go to and from station	40	0	0
Farm waggon	50	0	0
Reaper and binder (already ordered)	50	0	0
Header for grain	20	0	0
Winnower	10	0	0
Chaff-cutter and elevator	25	0	0
Horseworks	25	0	0
Separator	20	0	0
Pulper	15	0	0
Corn-crusher	15	0	0
1½ tons galvanised iron for cow shed, implement shed, cart shed, and chaff-cutting	33	0	0
Sacks and bags for grain and potatoes	30	0	0
Wear and tear and repairs	50	0	0
	£383	0	0
STOCK:—			
Pigs	50	0	0
Dexter cows (4)	100	0	0
Stallion fees for five mares, at £3· 3s.	15	15	0
	£165	15	0
Piping and taps for water and troughs	15	0	0
6 stretchers and mattresses, 18 coloured blankets, 12 pillows	20	0	0
Cooking utensils, crockery, cutlery, etc.	10	0	0
	£45	0	0

WORKING EXPENSES:—	£	s.	d.
Two men, £120, at £93 12s.	213	12	0
Extra hands, harvest time	30	0	0
Seed and manure	80	0	0
Meals, visitors, etc.	70	0	0
Students would cost about £40 a year each—say four	160	0	0
Sundries	50	0	0
	£603	12	0
Total	£1,197	7	0

The attached returns show, so far as I know, the total expenditure for which the farm is liable, the wages being up to end of this month. The fruit trees, I do not know exact amount, as with the exception of the almonds, which Mr. Despiessis said would do well. The other trees have been left to the judgment of Mr. Harper. The railway freights are also approximate, as I do not know the amounts until the vouchers are sent in.

I know of no other liabilities.

It is rather difficult to estimate the value of the cleared land, as none of the land here has ever had a fair trial of what its capabilities really are.

I have judged the value of the cleared land at the price brought by some land sold in the district last week—441 acres brought £1,000. The land was not all cleared, but the balance was rung. In the rest of the land valuations I think that, considering the subdivision I am rather under than over the mark. The permanent improvements I have put at cost price. The harness and implements I have allowed depreciation for the half-year at the rate of 10 per cent. per annum. The crops are estimated at less than average yields, and at half the prices ruling this year, as I anticipate low prices.

CHAPMAN EXPERIMENTAL FARM.

Account of Moneys paid since statement was forwarded and of moneys owing.

	£	s.	d.
Amount as per account 20th July	2,806	0	2
Sandover & Co., seed drill and potato planter, £56, less allowance £6	50	0	0
J. M. Ferguson & Co., gates for stockyard, shed, and paddocks	15	13	2
J. M. Ferguson & Co., 2 mantelpieces, cupboard shelves, and building material	16	1	6
Mr. Onetz, 1 Wyandotte cockerel	1	5	0
Rossiter & Co., artichokes for planting	0	12	0
Gray & Co., melon seed	0	8	0
	83	19	8

AMOUNTS OWING BUT NOT SENT IN YET—

	£	s.	d.
Cartage, about	0	10	0
Fencing not measured up yet, approx.	39	0	0
Wages to end of month, approx.	29	0	0
Hay, approx.	15	0	0
Sandover & Co., plough shares, augers, etc.	4	10	0
	88	0	0

FRUIT TREES ORDERED FOR DELIVERY NEXT MONTH—

Mr. C. Harper, approx.	15	0	0
Railway Freights, account not sent in, approx.	15	0	0
	£3,007	19	10

Valuations.

BUILDINGS, INCLUDING EIGHT-ROOMED HOUSE—

Large shed and stables	470	0	0
Fencing	481	9	11
Well, £80; well, £30; windmill, pumps, and piping, £50	160	0	0
20,000-gallon tank, £30; 2 5,000-gallon tanks, £20	50	0	0
Implements, £277 4s. 1d., less 5 per cent. depreciation half-year, £13 17s. 2d.	263	6	11
Feed in stock	33	0	0
Harness, £31 15s. 6d., less 5 per cent. depreciation half-year, £1 11s. 9d.	30	3	9
Manure in stock	4	12	6
	£1,492	13	1

STOCK:—

4 Dexter cows, to calve within few months, £30	120	0	0
3 „ yearling bulls	30	0	0
3 Angora goats	21	0	0
2 horses	60	0	0
6 stud pedigree Shropshire ewes	60	0	0
4 lambs from above, by champion ram	20	0	0
2 stud pedigree Shropshire rams, imported	30	0	0
100 merino ewes and lambs	125	0	0
50 Lincoln ewes and lambs	62	10	0
23 turkeys, American bronze	23	0	0
33 „ young	8	5	0
9 Wyandotte fowls	18	0	0
	£577	15	0

CLEARING AND RINGING:—

10 acres river flats, cleared and grubbed	60	0	0
190 „ cleared and in crop	380	0	0
200 „ ring-barked	125	0	0
250 „ mixed country	250	0	0
424 „ sand plain and low scrub	212	0	0
	£1,027	0	0
Estimated value of crop	527	10	0
	£3,624	18	1

Report on Maize and Potatoes grown at Hamel, South-Western Railway, Season 1903.

By G. F. Berthoud.

MAIZE.

The following varieties of maize were grown here last season on the lowland plots close to the brook. Although the past summer proved to be a dry one, the plants did not suffer from want of moisture. The yields may be taken as being fair for good soil. Most of the dent sorts take longer to mature and require better soil than the flint kinds. They are also the best and most prolific in suitable soil and climate:—

Culture.—The tall dent varieties were planted in drills, four feet apart, and the plants two feet in the rows. The dwarf flint kinds, three feet by 18 inches; land hoed and kept free from weeds during the growing season.

Manure.—Applied in the drills at the rate of four hundredweights per acre, composed as follows:—

Four parts superphosphate.
One part sulphate of potash.
One part sulphate of ammonia.

Early Yellow.

Local selection, sown 15th September; germination even; growth healthy and quick; stalk rather weak, liable to be laid by the high winds which often prevails here during the summer months; height when mature, eight feet; ripe first week in March; ears two to the stalk, eight inches long, well filled, with 10 rows of nice dented grain; colour bright yellow; core medium size, white or pale red; yield at the rate of 33 bushels per acre. Good early dent variety.

Crossbred Maize No. 1.

Local variety, cross between yellow dent and Japanese, type not yet properly fixed; selected seed, sown 16th September; germination even; growth healthy and vigorous; foliage wide; stalks strong, stand up nicely; height to 10 feet; ripe late, end of March; ears 10 inches long, two to the stalk, well filled with 14 rows of dark red dented grain; core medium size, pale red; yield good, at the rate of 45 bushels per acre. Good variety for culture in warm and moist districts.

Crossbred No. 2.

Local variety, selected from the No. 1 Crossbred, type not fixed; sown 16th September; germination good; growth vigorous and healthy; stalks strong, stand up well; height to 10 feet; ripe late, last week in March; ears 10 inches long, two to the stalk, well filled with 14 rows of dented grain; colour variegated yellow and other shades, on the same ear; core medium size, pale red; yield good, at the rate of 45 bushels per acre. Suitable for warm, moist districts. Prolific and curious variety.

HICKORY KING.

Local selected seed, sown 17th September; germination good; growth healthy and robust; height to 8 feet, stands up fairly well; ripe 15th March; ears eight inches long, two to the stalk; grain pure white, dented, large and handsome, eight rows; core white, very slim; yield good, at the rate of 36 bushels per acre. Good, white variety. Should be grown on rich soil and warm, moist climate.

CROSSBRED NO. 3.

Local variety, Golden Surprise and Hickory King, type not yet properly fixed, selected seed, sown 18th September; germination fine and even; growth quick and healthy; height eight feet; ripe second week in March; ears two to the stalk, eight inches long; grain wide and deep; colour pale yellow, capped white; 10 rows: core medium size, pale pink; yield good, at the rate of 40 bushels per acre. Requires further selection. Promising second early variety.

WHITE DAWN.

American variety, local seed; sown 18th September; germination even; growth healthy and vigorous; stalks rather weak, liable to be laid by strong wind; height eight feet; ripe end of February; ears eight inches long; two and three to the stalk; grain good, pure white dent, closely set, in 18 rows; core white and large; yield good, at the rate of 43 bushels per acre; prolific; early white variety.

AUSTIN'S COLOSSAL.

New American variety, imported seed; sown 18th September; germination even; growth very strong and healthy; wide foliage; plant stools out freely; would be useful to grow for fodder; height 10 feet; ripe 20th March; ears very large and well filled, 10 inches long, two to the stalk; grain deep, pale yellow dented, close, set in 18 rows; yield very good, at the rate of 56 bushels to the acre.

This should be an excellent sort to grow on good land in warm, moist places.

BRAZILIAN FLOUR.

Local selected seed, sown 22nd September; germination even: growth healthy and fine; plant stools out freely; stalks slender, but fairly strong, one of the very best for fodder purposes; height 10 feet; ripe late, last week in March; ears eight inches long, two and three to the stalk, closely filled with 10 rows of beautiful glossy white grain, very soft and flowery, of excellent milling quality; yield good, at the rate of 46 bushels per acre. Fine variety for warm and moist places.

GOLD CAP.

Distinct local selection from a yellow variety, introduced from Kansas, America, several years ago, sown 16th September; germination even; growth quick and strong; stalks firm, stands up well; height nine feet; ripe latter end of March; ears two and three to the stalk, thick set, nine inches long, well filled with 16 rows of fine dented corn; colour rich glossy red with bright yellow cap, giving it a very distinct appearance; yield very good, at the rate of 60 bushels per acre. Requires good strong land and warm moist climate.

CUZCO.

Imported seed, sown 20th September; germination slow and uneven; growth weak, stalks slim; plant produces one stalk only, is weak, and falls over badly in windy weather; height nine feet; ripe very late, end of May; ears six inches long, one poor stalk badly filled, grain pure white, very large, soft, and flowery, set in eight rows, core white, medium size; yield very light. This variety introduced from Peru, does not mature properly here, and is not profitable to grow.

HARRIS GOLDEN FLINT.

Local selected seed; sown 23rd September; germination good; growth fair; plant hardy and dwarf; height five feet; ripe first week February; ears 11 inches, long and slim; grain of fair size, deep yellow; closely set in eight rows; core large and white; yield fair, at the rate of 30 bushels per acre; useful, hardy variety, which will succeed in fairly good land, and mature earlier than the dent sorts.

JAPANESE VARIEGATED.

Local seed, sown 15th September; germination good; growth healthy and fine; plant stools out freely; foliage striped in various shades of green, white, and bright pink, which makes it a useful decorative plant for garden work; height four feet; ripe first week in February; ears small, six inches long, two and three to the stalk; grain small, pale yellow, closely set in 14 rows; hardy and prolific; will succeed on moderately good land; suitable for feeding to poultry.

POTATOES.

TRIAL OF NEW VARIETIES.

The following 51 sorts were all imported last season, and grown here during the past summer and autumn. Owing to the weather being very dry during the whole time of growth the yields of tubers proved to be light, and this test cannot be called a fair one, especially for the late varieties, which were not fully matured when taken up at the end of April. Several of the kinds are promising, and may prove to be useful. The "Factor" appears to be a really superior and prolific variety.

Soil.—Low land, close to brook, of good quality, and for a part of the time fairly moist; in cultivation for the first time.

Culture.—The drills were three feet apart, and the sets planted four inches deep every two feet along the row.

Manure.—Consisting of—

Four parts superphosphate,
One part sulphate of potash,
One part sulphate of ammonia,

applied evenly along the drills, at the rate of 6cwts. per acre, at the time of planting.

ABUNDANCE.

Imported from Dobbie & Co., Rothesay, Scotland. Planted 5th January, 1903; up 16th; germination good; growth fairly strong; height of stalks 16 inches; taken up 25th April. Potatoes set close to the stalks; tubers large, round; skin pale, creamy white; eyes shallow; fair market variety; yield at the rate of four and a-half tons per acre.

THE CROFTER (Dobbie).

Planted 5th January; up 18th; germination good; growth healthy and strong; height of plant two feet six inches; taken up 25th April; tubers of fair even size; round eyes, shallow; skin white, slightly rough; yield good, at the rate of five and a-half tons per acre.

FAVOURITE (Dobbie).

Planted 5th January; up 17th; germination even; growth vigorous and healthy; plants two feet in height; taken up 25th April; tubers of fair market size; round; white skin, russety; nice form; shallow eyes; good variety; yield at the rate of six and a-quarter tons per acre.

BRITISH QUEEN (Dobbie).

Planted 5th January, up on 17th; germination fair; growth rather weak; height of stalks 16 inches; not fully matured when taken up 25th April; tubers good size; fairly uniform; white and round eyes; deep skin; smooth, prolific, market variety; yield at the rate of seven and a-half tons per acre.

WAVERLEY (Dobbie).

Planted 5th January; germination good; growth robust; stalks strong; leaf smooth and wide; height of plant two feet; taken up 25th April; tubers of fair size; kidney shape; skin somewhat rough, of a pale pink; yield fair; rate per acre four and a-half tons.

THE FACTOR (Dobbie).

Planted 5th January; germination even and fine; growth healthy and vigorous; height of stalk two feet; taken up 25th April; tubers oblong, large, few small ones; skin white; eyes shallow; yield very good; at the rate of nine tons per acre; the most promising new variety grown here this season.

UNIVERSAL (Daniels, Norwich, England).

Planted 5th January; germination good; growth healthy; height of stalks 18 inches; taken up 26th April; tubers white and round; fair size; skin white, slightly rough; eyes set medium deep; yield at the rate of three and a-half tons per acre; fair late variety.

THE SIRDAR (Daniels).

Planted 5th January; germination good; growth healthy and vigorous; height of plant 18 inches; taken up 27th April; tubers large and round, sometimes oblong; skin white, smooth, with shallow eyes; yield at the rate of four and a-quarter tons per acre.

PRINCESS MAY (Daniels).

Planted 5th January; germination fair, but slow; growth rather weak; height 16 inches; taken up 27th April; tubers of fair, even size, oblong; pink, smooth skin; shallow eyes; keeps well; not fully developed when dug; yield at the rate of four tons per acre; late variety.

THE NORWICH (Daniels).

Planted 5th January; germination fair, but slow; growth medium; height 14 inches; taken up 27th April; tubers round, large, yellowish; white skin, slightly rough; eyes rather deeply set; late and fair keeper; yield at the rate of four tons per acre.

PURPLE RUSSET (Daniels).

Planted 5th January; germination slow; growth late and weak; height 14 inches; taken up 27th April; tubers flat and round, of fair size; skin rough, deep purple; yield at the rate of three and a-half tons per acre; good table quality; distinct variety.

ROYAL SOVEREIGN (Daniels).

Planted 5th January; germination slow; growth weak and poor; height one foot; taken up 27th April; the tubers were then not fully matured; round, white, medium size; even shape; shallow eyes; yield poor, at the rate of less than three tons per acre.

FRANCO-RUSSE (Rivoire, Lyons, France).

Planted 12th January; germination good; growth strong and healthy; height 18 inches; taken up 27th April; tubers large and round, set close to stalks; skin smooth, bright purple; yield good, at the rate of seven and a-half tons per acre; not fully matured when dug; promising new variety.

PRESIDENT DU CORNICE (Rivoire).

Planted 12th January; germination fair; growth rather weak; height 15 inches; taken up 27th April; tubers large, oblong; skin smooth and white, flaked, bright purple; yield light, at the rate of three tons per acre.

ASPASIA (Rivoire).

Planted 12th January; germination weak; growth poor; height one foot; taken up 27th April; tubers small and oblong; skin smooth, yellow, flushed dull purple; yield very poor, under two tons per acre.

FERD GAILLARD (Rivoire).

Planted 12th January; germination good; growth healthy and fine; height 18 inches; taken up 27th April; tubers large, flat, and round, nice even size; skin yellow; eyes shallow; yield fair, rate of four and a-half tons per acre.

MODELE (Rivoire).

Planted 12th January; germination good; growth weak. This is an early variety; taken up 27th April; tubers of fair size, oblong; skin very smooth and white; eyes shallow; yield light, at the rate of two tons per acre; good table quality.

CRAPANDINE (Rivoire).

Planted 12th January; germination bad; growth late and very weak; height one foot; taken up 27th April; tubers small and round; skin deep brown, cracked, and rough; eyes set shallow; yield light, under two tons per acre; very distinct variety.

GABRIEL FAVRE (Rivoire).

Planted 12th January; germination slow; growth weak; height one foot; taken up 27th April; tubers long, kidney shape; white, smooth skin; eyes shallow; yield light, under two tons per acre; poor variety.

HOSPITALIERE (Rivoire).

Planted 12th January; germination slow and uneven; growth weak; height one foot; taken up 27th April; tubers small, round; skin smooth, deep purple, blotched with yellow; yield very light; poor variety.

COLOSSE (Rivoire).

Planted 12th January; germination fairly good; growth healthy; height 15 inches; taken up 27th April; tubers large, round, even size; skin smooth, pale pink; eyes bright and deeply set; yield at the rate of three tons per acre; fair second early variety.

FEDELIS (Rivoire).

Planted 12th January; germination slow and uneven; growth fairly good; height one foot; taken up 27th April; tubers, kidney shaped, neat form; skin pale purple; eyes shallow; yield light; not a promising variety.

CELERITAS (Chili, South America).

Planted 12th January; germination slow and uneven; growth very weak; height nine inches; taken up 27th April; tubers small, oblong; skin smooth; eyes deep black and numerous; yield very light; distinct and curious variety, but useless for market purposes.

CAUCHAU (Chili).

Planted 12th January; germination fair; growth healthy, but rather slow; height 18 inches; taken up 27th April; tubers round, large; eyes deeply set; skin smooth, bright purple; yield at the rate of 4½ tons per acre; fair late variety.

PASTANESSA (Chili).

Planted 14th January; germination good; growth vigorous and healthy; height two feet; taken up 27th April, when not fully matured; tubers round to oblong, nice even size; eyes deeply set; skin smooth, white, flushed and blotched with pink; yield at the rate of three tons per acre; fair late variety.

MANGU BLAUCA (Chili).

Planted 14th January; germination fair; growth good and healthy; leaf curled; stalks spreading; height 16 inches; taken up 27th April; tubers round, white; skin rough; eyes deep set: shape and size very uneven; too many are small, not fit for market; yield at the rate of 4½ tons per acre; poor variety; not desirable.

HUAICHAL (Chili).

Planted 12th January; germination good; growth upright and healthy; height 18 inches; taken up 27th April; tubers fairly even in size and set close to stalks; flat, round; skin white and smooth; eyes small, deep purple; nice clean variety, should be suitable for hot climates; yield four tons per acre; promising late variety.

AMERICANA (Chili).

Planted 14th January; germination good; growth upright and vigorous; height of stalks two feet; taken up 27th April, but not fully matured; tubers large and round; skin black purple; eyes deeply set, nice and even in size; very distinct sort; yield at the rate of five and a-half tons per acre; good keeper; should be useful in warm, moist climates.

ARAUCANA MUSCA (Chili).

Planted 14th January; germination slow; growth fairly strong and healthy; height 16 inches; taken up 27th April, not fully matured; tubers flat-round; eyes deeply set; skin smooth, pale purple, few yellow blotches; yield at the rate of four tons per acre; promising late variety.

CANQUI (Chili).

Planted 14th January; germination good; growth healthy; height 18 inches; taken up 27th April, not fully matured; tubers round; white, skin rough, very uneven in size, too many are under market size, therefore unprofitable to growers; yield good, at the rate of six and a-half tons per acre; not a desirable sort.

DOYES (Chili).

Planted 14th January; germination fair; growth good; height 18 inches; taken up 27th April, not fully matured; tubers white and round, skin rough, very uneven in shape and size; many are too small for sale; yield four and a-half tons per acre; poor variety, not suitable here.

BOLERA (Chili).

Planted 14th January; germination fairly even; growth rather weak; height 14 inches; taken up 27th April; tubers round, small in size; skin smooth, yellow, and blotched pale purple; yield at the rate of four tons per acre; not a very promising variety.

FRANCESCA COLORADA (Chili).

Planted 14th January; germination slow; growth fair, but late; height of stalk one foot; taken up 27th April; tubers round, roughly shaped; skin white; eyes bright pink, deep set; yield light, at the rate of three tons per acre; poor late variety.

ARAUCANA (Chili).

Planted 14th January; germination fair; growth weak; height one foot; taken up 27th April; tubers round, small in size; skin smooth; pale purple, blotched with white; eyes deeply set; yield light, at the rate of three tons per acre; poor late variety.

SOLANUM CUMMERSONII (Mexico, Wild Potato).

Planted 14th January; germination good; growth healthy; stalks low down, spreading over the soil very rapidly; each plant covers about three yards of land; stalks four inches in height; taken up 27th April, not then fully matured; tubers, white oblong, one to two inches long, mostly on the ends of long white roots; this very distinct wild potato may prove useful for cross-breeding, otherwise useless; yield very light.

SOLANUM SPECIES (from Mexico, also a Wild Potato).

Planted 14th January; germination good; growth healthy; leaves small; height one foot; flowered and seeded freely, but failed to form any tubers; taken up 27th April; not a desirable variety.

SOLANUM OHRONDII (Mexico, Wild Potato).

Rather nice looking tubers, which reached here in bad condition, and failed to come up; said to to be a promising wild variety of potato.

MURTA (Chili).

Planted 16th December, 1902; germination very weak, only one tuber came up. This plant grew weakly for a couple of months, then died off without forming any tubers.

CHAMPION (Irish).

Planted 14th January; germination slow; growth fairly robust; stalks 16 inches in height; taken up 27th April; tubers round and white; skin slightly rough; deep eyes; uneven in size, and not attractive for market; yield at the rate of four tons per acre; late variety not very promising.

ADRIONDACK (American).

Planted 12th January; germination very slow; growth vigorous and healthy; height 18 inches; taken up 27th April; tubers round; skin smooth, bright pink, blotched with yellow; eyes deeply set; yield at the rate of three tons per acre; fair late variety.

IDAHO (American).

Planted 14th January; germination slow; growth poor and weak, owing to soil being too dry; height of plant one foot; taken up 27th April; tubers of fair even size, round; skin white; eyes shallow, tinted pink; yield at the rate of three tons per acre; fair variety.

THE ENORMOUS (American).

Planted 14th January; germination very slow, in part failed, owing to soil being too dry; height one foot; taken up 27th April; tubers large, oblong; skin smooth and white; should be a good variety when grown under more favourable circumstances.

HANNIBAL (Germany).

Planted 14th January; germination good; growth vigorous; stalks two feet in height; taken up 27th April, when not fully matured; tubers oblong, medium size; skin smooth, pale pink; eyes shallow, bright red; yield at the rate of four and a-half tons per acre; fair late variety.

PRIDE OF SAVOY (Germany).

Planted 14th January; germination good; growth healthy but dwarf; height of plants one foot; taken up 27th April; tubers oblong, fair even size; skin smooth, white, flushed pale pink; eyes shallow; yield at the rate of four tons per acre; fair early variety.

GOAT'S HORN (Germany).

Planted 14th January; germination good; growth fair, about one foot high; taken up 27th April; tubers long, kidney shaped; skin smooth, pale pink; said to be of fine table quality; yield at the rate of two tons per acre; too small for market.

GOLD BALL (Germany).

Planted 14th January; germination good; growth weak, owing to soil being too dry; taken up 27th April; tubers small and round; skin yellow; eyes deeply set; yield at the rate of two and a-half tons per acre; late variety.

LONG RED HORN (Germany).

Planted 14th January; germination slow; growth dwarf and rather weakly; height of plants one foot; taken up 27th April; tubers long, curved, and thin; skin smooth, bright red; eyes shallow; too small for market; said to be of excellent quality for salads, etc.; yield at the rate of one and a-half tons per acre; curious and distinct variety.

ZWIEBEL (Germany).

Planted 14th January; germination good; growth healthy and vigorous; height of plants two feet; taken up 27th April; tubers flat and round, of fair, even size; skin rough, pale pink; yield good, at the rate of six tons per acre, of first-class table variety; fair mid-season variety.

CIRCASSIENNE (Germany).

Planted 14th January; germination rather slow and uneven; growth healthy; height 18 inches; taken up 27th April; tubers medium size; skin smooth, pale yellow; eyes shallow; yield at the rate of four tons per acre; fair late variety.

DR. VON LUCIUS (Germany).

Planted 14th January; germination good; growth strong and healthy; height two feet; taken up 27th April, not then fully matured; tubers round, nice even size; deep eyes; skin smooth, clear white, set close to the stalks; yield at the rate of six tons per acre; fair healthy late variety.

POMERIANIA (Germany).

Planted 14th January; germination good; growth healthy; height 16 inches; taken up 27th April; tubers of fair size, round; pink eyes; shallow and bright in colour; yield at the rate of four tons and a-half per acre; fair late variety.

ZAMIA PLANT.

Report as to its Poisonous Properties.

The Department of Agriculture has for some time been engaged in investigating the injurious properties of the Zamia Plant. The following analysis, together with the reports of Dr. Morrison and Mr. S. S. Dougall, are the result so far obtained. The matter, however, will not be allowed to rest here, but will be further investigated.

The Acting Director, Mr. S. S. Dougall, forwards the following analysis of Zamia Palm for fodder purposes:—

The sample was treated with cold water to extract the poisonous matter, then dried at 212° Fahr. The analysis has been made on the dried sample.

Oil	1·323	per cent.
Albuminoids	8·750	,,
Carbo-hydrates	67·632	,,
Fibre	18·933	,,
Ash	3·362	,,
	100·000	

Albuminoid ratio	1 to 8·14
Fat chaff albuminoid ratio ...	1 ,, 6·75

Although it has not so good an albuminoid ratio as oat chaff, yet it has a higher feeding ratio weight for weight. As the chaff has about 15 per cent. water, to compare the feeding ratio, it will be necessary to calculate the Zamia sample with 15 per cent. of water, as follows:—

	Zamia.	Chaff.
Water	15·000 ...	15·000
Oil	1·124 ...	1·500
Albuminoids ...	7·427 ...	5·000
Carbo-hydrates ...	57·487 ...	30·000

2 of Zamia is equal to 3·5 of chaff.

This sample is not so well adapted for young animals. It is best adapted for fattening adult animals.

The Director of Agriculture,

Sir,—Agreeable to the request of the late Hon. the Minister for Lands and Agriculture, Dr. A. Jameson, I undertook the investigation into the poisonous properties of the Zamia palm, with the view of eliminating the poison if any was contained therein, and if possible to discover an antidote for any poison it might contain. The physiological part of the work was undertaken by Dr. A. Morrison and Mr. R. E. Weir.

I have the honour to report my results so far as the investigation has gone. This report should appear as an interim report on the work done, but as I am severing my connection with the Department of Agriculture, it will be taken as a final report so far as my work in the investigation is concerned.

The investigation was divided in three different and separate parts—namely, the pith, woody part, and the nuts, so as to decide whether all or any of these contained a poison, and in which the greatest amount of poison was to be found.

The class of poisons that were principally looked for were the alkaloids and glucosoids. With this in view, on the 22nd November, 1902, a series of solutions were commenced, with pure water extracts and with water slightly acidified, from the pith and the woody part of the palm.

As these solutions were intended to be of a primary nature for the purpose of answering the question whether the different parts of the plant contained a poison or only in one or the other parts in sufficient quantities to be poisonous. On that account no separation of the different classes of poisons was attempted.

A great difficulty was experienced in the making of these aqueous extracts to keep them in a liquid state, and in a sufficiently concentrated form, owing to the large amount of saccharine, resinous, tannin, etc., matter that was dissolved out in the different aqueous solutions. It was found inadvisable to concentrate them further than 1¾oz. of fluid extract for each pound of the plant used; by concentrating to that extent a large amount of the resin and tannin was got rid of.

A sample of each of these solutions was given to Dr. Morrison and Mr. Weir. The results of the action of these solutions on guinea-pigs are given in the reports of Dr. Morrison and Mr. Weir.

Although Dr. Morrison would seem to have had some results of a poisonous nature from the pith solutions, yet they are so inconclusive of an actual poison in that part of the plant that Dr. Morrison is doubtful on this point himself—at least there was not sufficient evidence to come to a definite conclusion that the guinea-pig died from a poison extracted from the pith of the Zamia. Mr. Weir says he had absolutely no results of a poisonous nature, although he had equal quantities of the same solutions that were supplied to Dr. Morrison.

It was now evident that if there was a poison of an alkaloidal or glucosoidal nature in the Zamia palm supplied to me, it was either not soluble in water, or that hydrolysis of the poison had taken place in the concentration of the large amount of solution obtained in the extraction. Some alkaloids, and more especially glucosoids, are liable to hydrolyse into inert or non-poisonous substances at elevated temperatures.

The next set of solutions were made with strong alcohol, which dissolves most of the alkaloids and glucosoids, and allows of their being concentrated at a much lower temperature. These alcoholic solutions were not used as in the aqueous extracts, as a single solution of all the possible poisons the palm might contain, but were fractioned out to divide the different classes of poisons, and also to free them from the saccharine, resinous, and tannin matter.

These different fractions were concentrated in those for the glucosoids to ½oz. to the pound of plant ,and those for alkaloids to a little more than ¼oz. to the pound of plant.

According to the reports of both Dr. Morrison and Mr. Weir, there were no poisonous results from any of these solutions.

The next set of solutions were made from alcoholic abstracts from the Zamia palm nuts. I may say that the sample of nuts I had to work with were very old; how old I could not learn.

The extract from the nuts was treated with the view of actually isolating any alkaloid they might contain. I succeeded in obtaining a very small quantity of an alkaloidal substance from them. As the amount was very small, I thought it best not to divide it into two, but to give the whole of it to Mr. Weir, as he had a guinea-pig to operate on.

From Mr. Weir's report there was no poisonous results; and further he says "that these results lead him to suppose that no poisonous matter exists in any portion of the Zamia palm; but before being quite decided on the point, it would be advisable to have a further experiment tried by way of supplying it to an animal in the form of food."

These results would point to there being no poison in the Zamia palm; but this conclusion cannot be arrived at from these investigations alone, but rather that the old butts of the Zamia and old nuts such as were supplied to me do not contain a poison, and yet the young green leaves may act as a poison.

There are a good number of people who deny or disbelieve in the statement of wobbles being a Zamia poison pure and simple. They maintain that the whole of the symptoms of supposed Zamia poisoning may be caused by impaction from eating other green feed than Zamia leaves after the animal has become poor from poor food. It is only at a certain season of the year that the evil effects from eating the Zamia leaves takes place, and at other seasons there are no poisonous or dangerous effects from eating the Zamia leaves. It is also stated a large number of supposed zamia poisoning has really been cases of other diseases, such as pleuro-pneumonia.

Be that as it may, these investigations do not settle the point between poison and impaction.

As it is only at a certain season of the year that the Zamia is dangerous to cattle, that is when the young green leaves come out on the palm; then the cattle, from long fasting from green food, or from the cattle having an inclination to eat the young green leaves of the palm, are affected with the poison which may be in the young leaves.

That there may be a poison in the young leaves, and that this poison may disappear from the butt of the palm later on in the season by a process of hydrolysis in the plant, will be better conceived and understood when we consider the fact that the unripe grape contains a large amount of tartaric acid, a large proportion of which is converted into saccharine matter in the process of ripening; in the orange, citric acid is converted into saccharine matter, and in the apple, malic acid is converted into saccharine matter. As I have only had the butt and nuts, which were of an indefinite age, to work with, and none of the young leaves, it is quite within the range of possibility that a poison may be found in the leaves of the Zamia palm.

The symptoms of Zamia poisoning, as described by different authorities, are very conflicting and difficult to harmonise. In some cases they would almost point to an irritant rather than a true poison, in others they appear to be more of an astringent nature, while in other cases that astringent action does not appear. And in some cases the symptoms are described which are diametrically opposed to those described in other cases.

The poisonous action of the Zamia palm may be either by a direct poison or by some substance acting as an irritant, causing a reflex action on the nerve centres which may produce partial or complete paralysis of the system.

As stated by Dr. Morrison, an active irritant is exuded by one of the same family of plants grown in the East Indies, and which is used to some extent in surgery.

No investigation was made into any action the resinous matter may have on animals, which might throw some light on the matter of poisoning by the Zamia.

It is with regret I am closing my work on this subject.

I have, etc.,
S. S. DOUGALL.

THE DIRECTOR,—I have the honour to report as follows on some experiments by me on guinea-pigs, with solutions prepared by Mr. S. S. Dougall, Analytical Chemist to the Department, from the "Zamia palm," *Macrozamia Fraseri.*

18th December, 1902.—One drachm of extract made from the pith (1lb. in 50 ccm. of solution) was given by mouth to a large guinea-pig, between 11 a.m. and noon. At 12·30 no result was apparent, and two drachms were given in the same way. At 10 p.m. the animal was found to be ill. It could hardly be urged to move on, and although the forelegs were sometimes used, the hind limbs remained passive. The eyes were considerably affected with ptosis, the eyeballs projecting so as to show a white ring of the sclerotic membrane round the iris, while the tears overflowed so as to wet the hair on its face, and the conjunctiva lining the eyelids appeared swollen.

Next day the guinea-pig had nearly recovered from these symptoms, and the day following was almost well again, and was taking its food.

20th, 11 a.m.: Gave some of the same pith solution by mouth. At 5 p.m. the animal was drowsy and lethargic, the eyes showed a narrow band of the white selerotic, but without any overflow of tears.

21st, 5 p.m.: Animal recovering. Gave again about two drachms. At 10 p.m. it was found to be depressed; it sat flatter on the table and moved about occasionally as if restless, the hair on its head and shoulders also being more erect.

22nd: The guinea-pig was found in a dying condition, its respirations were laboured and slower, and it moaned as if in pain. Reflex action appeared to be increased, any touch or handling causing it to start or jerk and groan, and the body felt quite chilly to the hand.

At 3·15 p.m. the following *post mortem* appearances were noted: *Rigor mortis* well developed. Lungs, right pale, with a few dark patches; left congested (*post mortem*). Heart, cardiac veins injected, right ventricle filled with blood-clot, left empty. Stomach studded on left side with dark ecchymossed spots the size of a match head, the attached mesentery swollen with clear amber-coloured oedemar. It contained a considerable quantity of soft green pultaceous material, and was somewhat inflated with gas, and its walls were so softened and tender as to tear when lifted by the forceps. The intestines contained food, and their mesentery was at parts oedematous. The kidneys and liver appeared normal. The veins of the cerebral membranes were congested, and the substance of the spinal marrow was quite pale.

Another guinea-pig was similarly treated with a solution of the woody portion of the Macrozamia stem (1lb. of stem to 1¾ozs. of solution), but without any reliable result, as the animal was found to be suffering from some disease that caused its death.

Other solutions were received from Mr. Dougall, better suited for hypodermic injection, being more concentrated as well as clearer and thinner. These solutions were injected under the skin of the back, but no result followed other than could reasonably be ascribed to the operation itself, the guinea-pigs being in a depressed condition for a few hours after the injections, but quite recovered the following day.

I could not undertake to say how much of the symptoms or *post mortem* appearances seen in the case of the guinea-pig treated, as above described, on 18th December, may have been due to a simple irritant or astringent on the stomach, or to what extent the action of a specific poison may have contributed to the results; but no signs of astringency, such as constipation, were observed. Instances are on record where the use of the nuts of Macrozamia as food by human beings, has been followed by violent disturbance of the digestive organs, indicating other properties, we should think, than astringency or indigestibility. Is may well be that a toxic element peculiar to the plant, producing the disease of "wobbles," has a remote effect on the nervous system, may also exert a local irritant action on the walls of the stomach; or, on the other hand, there may be other constituents having that property independently of the specific poison.

Mr. H. H. Edwards, in his account of experiments with *Macrozamia Fraseri* (report on the disease known as "rickets" or "wobbles," in *Journal* of the Bureau of Agriculture of Western Australia, I., 225, 27th November, 1894), notes the absence of stomach symptoms or *post mortem* appearances in that organ after continuous feeding with the plant, but the chopped leaves mixed with other food given to cattle are very different from the solutions made by Mr. Dougall, in which any soluble ingredient having irritant properties would be in a concentrated form. This was shown by Mr. Edwards in an experiment made by giving an infusion of the cone of the *Macrozamia* to a bullock that was slaughtered on the following day, when he found the fourth stomach and small intestines highly congested, and patches of congestion in the liver and kidneys. These appearances were ascribed by him to the astringent action of the infusion.

The absence of any special result after the hypodermic injection of the four solutions (marked A, B, C, and D) prepared by Mr. Dougall, although they were of concentrated strength, would seem to show that the poison, if any, had been dissipated or broken up in the process required for their preparation; and this seems all the more probable since it is well known to be the custom of the aborigines to render the nuts innocuous by soaking or burying them for a certain length of time, while cooking appears to have the same effect. The solubility of the injurious constituents in water is demonstrated by the preparation of wholesome sago or arrowroot from the pith of cycadaceous plants, by simply breaking it up and separating the farina from the woody material by repeated washing and straining. It may be mentioned that the clear gum obtained from *Cycas circinalis* in the East Indies is used as an irritant in surgery, for the rapid production of suppuration, by applying it to malignant ulcers.

ALEX. MORRISON.

19th June, 1903.

The matter will be referred to Mr. Weir, the Government Veterinary, for his report, on receipt of which it will be published in the *Journal*.

REPORT OF BEE-KEEPERS' CONFERENCE.

The Annual General Meeting and Conference of Beekeepers, held in Perth on 29th July last, was fairly well attended, and the discussions on the various questions showed a generally good feeling to exist amongst those present, which, if maintained throughout the now present year, should tend to advance the industry.

The following are the names of the representative members present:—Mr. J. N. Shipton (Subiaco), President, in the chair; Messrs. Kline (Guildford); Captain Oats, Ankers, Dickie, Arnott (Perth); J. Poole, J. James, J. Street (Leederville); A. E. Frape (Cottesloe Beach); F. J. B. Clifton (Australind); — Boehn, S. Cheney (Lion Mills); C. Clifton (Harvey); J. Sutton (Drakesbrook); G. Johnston (Albany); A. P. McCormick (Coolgardie); F. H. Layton (Donnybrook); Mr. and Mrs. Hilton (Victoria Park); and W. Potter (Claremont), Secretary.

The minutes of the previous meeting having been read and confirmed, the President asked permission to adjourn the reading of his report until the afternoon, in order that the morning should be devoted to the re-adjustment of the prize schedule for the Royal Agricultural Society's Meeting, to be held at Guildford, this year. The Bee-keeper's Association having been in communication with the Secretary of the Royal Agricultural Society in this matter, with the result that they have, to some extent, been asked to supervise the Apiarian Section.

The result of the morning's work has been to increase the number of classes in the section from 12 to 16, and the prize money from £6 to between £12 and £13, without having interfered with the entrance fees.

This work having been completed, the President, with Mr. Sutton and the Secretary, were asked to meet Mr. Lowe, of the Royal Agricultural Society, and deliver to him the amended schedule, and, if necessary, to make any alterations in the same that may be deemed necessary.

The meeting was adjourned from 12 to 2·15 p.m.

After lunch the President reported having met Mr. Lowe, and that the schedule had been accepted with all amendments, and, also, that Mr. Lowe had requested this Association to nominate some competent person as judge to the Apiarian Section.

The President then read his address, as follows:—

Report of the President of the W.A. Bee-keepers' Association.

Ladies and Gentlemen,—In making a report of this year's work of the Association, I wish to state that the present officers were elected at the annual meeting held 4th November, 1903.

At the following meeting, held 2nd December, it was decided to hold meetings on the second Wednesday in each month, at which, with one exception, a quorum has been present, and interesting meetings held.

The principal motions carried have been in connection with—

(1.) Amendment of the Foul Brood Act of 1899;
(2.) Exhibiting at the Royal Agricultural Show;
(3.) Honey export;
(4.) Representation at the Producers' Conference; and
(5.) Foundation of District Associations for the advancement of bee-keeping.

(1.) In reference to the Foul Brood Act, mainly by the efforts of this Association a Bill has been drafted for the amendment of the Contagious Diseases of Bees Act of 1899, which should give satisfaction to all persons interested in bee-keeping.

(2.) *Re Exhibitions.*—The matter of better accommodation at the new show grounds has been considered, and other societies in the Eastern States have been communicated with for advice in this direction. The Royal Agricultural Society seems disposed to give every assistance possible to carry out the suggestions of this Association.

(3.) *Re Honey Export.*—The Agent General of this State has been communicated with, and it is not considered advisable, owing to smallness of local supply and low prices obtainable in England, to take further steps at present in this matter.

It is, however, to be hoped that bee-keepers generally will endeavour to better grade their honeys before placing on the market, as by this system only can a regular satisfactory price be obtained. You will be asked to consider, in the near future, the advisableness of establishing a central depôt honey exchange for this purpose.

(4.) *Re Representation at Producers' Conference.*—By the request of the Hon. the Director of Agriculture, this Association was invited to send a delegate. Mr. Jno. Sutton was unanimously voted to fill the position. The main item brought forward by the delegate was the matter of food adulteration, when the motion proposed was as follows:—"That, in the opinion of this Conference, steps should be taken making it necessary that all persons responsible for the manufacture or production of food stuffs should have attached to package containing same, as a guarantee of quality, a label giving the name of article contained therein, or when such contents are made up of two or more parts, the name of each part should be stated." This motion was discussed, and it was considered as being so far-reaching that it would require a special Act of Parliament to deal with it.

(5.) *Re District Associations.*—This matter has been discussed in a broad-minded manner, with the result that it was considered advisable to summon this Conference to thoroughly deal with the question.

It is with great regret that the decease of Mr. Hipwell, one of the members of the committee, has to be chronicled. Mr. Hipwell always took great interest in the meetings, and never missed one single meeting. His knowledge of bee-keeping—and particularly his enthusiasm—will be a great loss to the Association. A letter of condolence has been sent to his relatives.

In concluding this report, I wish to thank the members of the W.A. Bee-keepers' Association for their support and attendance at the monthly meetings. The thanks of the Association are especially due to the secretary (Mr. W. Potter), and also to Mr. Jno. Sutton, for the special interest they have taken in sparing no inconvenience to further the welfare of the industry.

Wishing the Association a most successful year of work,

I have, etc.,

J. N. SHIPTON, President.

After the reading of the address, the Secretary read communications that had been received from the various States in reply to a circular (that had been issued by the Department of Agriculture at the request of this Association) asking for information as to what class of buildings were most suitable for exhibition purposes. Many answers were received, some of which were accompanied with photographs. After the letters had been read, the following was proposed :—" That this Conference thanks the Departments of Agriculture and other bodies throughout the Australian States for their kindness in replying to the questions asked."—Carried.

The next item to come up for discussion was with regard to the formation of country branch associations. This question caused much discussion as to the best method to start the formation of the much desired branch associations, with the result that Captain Oats moved—" That this Conference empowers the Secretary to forward circulars to persons in various districts, asking for every assistance in the formation of branch associations, and at the same time detailing to them the advantage of so doing."—Carried.

Mr. Kline suggested that country districts should form associations and then apply to be affiliated with the Perth Association as the head governing body.

Mr. McCormick moved—" That country associations should be formed as branch associations, and should be charged an affiliation fee of 10s. 6d. per annum to the main or Perth body."—Carried.

Mr. Layton moved—" That the Secretary communicate with the secretaries of the various agricultural and other societies throughout the State, asking them to inform any of their members who should be interested in bee-keeping."—Carried.

Messrs. McCormick, Layton, Johnston, and others promised to give every assistance in forming branch associations in their respective districts.

Mr. Layton moved—"That the Department of Agriculture be asked to answer through the JOURNAL OF AGRICULTURE any questions addressed to the Department on bee-keeping."

Mr. Sutton, in reply, stated that the Department desired bee-keepers' to state their questions, when the answers or information required would be published in the next issue.

The question of how to dispose of honey and to obtain a fair and profitable price is one that requires a lot of thought, but it may yet be got over by the formation of a honey exchange. It was the question of how to successfully work a concern like this that called forth many suggestions. Mr. Cheney read a paper which dealt with the subject, showing how much such an institution was needed in Western Australia, and giving his personal experiences of the working of a similar institution in connection with the dried fruit business in the Mildura district of Victoria, which were certainly of a prosperous nature.

Mr. Layton moved—"That it is the desire of this Conference that the committee appointed shall take steps at the earliest opportunity to formulate a scheme with the object of establishing a honey exchange to regulate the wholesale and retail prices of honey."—Carried.

Mr. McCormick moved—"That the Government be asked to legislate in order to prevent vendors disposing of honey that has been adulterated, or any composition manufactured to resemble honey, as pure honey in any form."—Carried.

Mr. Layton asked, Would it be advisable and practicable for this Association to fix the minimum wholesale price of honey?

Mr. Sutton moved, in reply—"That this Association should from time to time fix the minimum wholesale and retail prices of honeys, according to various standards."—Carried.

Mr. Cheney moved—"That the Secretary write to all known bee-keepers in the State, setting forth the desire of the Association to fix a uniform price, asking them, Do they desire to fall in with the idea? If so, what would they suggest as a fair price?"—Carried.

Mr. McCormick moved—"That the Government be approached and asked for a grant of money to assist in carrying on the work during the present, and to extend the operations of this Association."—Carried.

Mr. Layton moved—"That all members possible meet the following morning and form a deputation to wait on the Minister of Lands and lay their requests before him."—Carried.

Mr. Layton moved—"That this Conference ask the Department of Agriculture to raise for distribution, for street and ornamental planting, trees that are good honey producers, and which blossom at a time when there is a natural dearth among the indigenous trees of this State, say, during the months of October, November, and December; also, to procure for distribution amongst bee-keepers seeds of various foreign honey plants."—Carried.

The election of officers which followed resulted as under:—President, Mr. Shipton (re-elected); Vice-Presidents: Capt. Oats, Messrs. Hilton, Kline and Sutton; Secretary and Treasurer: W. Potter (re-elected); Committee: Messrs. Masterton and Taylor (re-elected), also, Messrs. Ankers, Dickie, Cheney, Ainsley, and Street; Auditors: Messrs. Sutton and Ankers (re-elected).

The first day's meeting concluded with a resolution (proposed by Mr. Sutton) that the date of the ordinary meeting be the third Wednesday in the month, instead of the second as hitherto.

Conference adjourned until Thursday, 10 a.m.

THURSDAY.

The adjourned meeting of bee-keepers was concluded this morning, when those members present were introduced by Capt. Oats, M.L.A., to the Minister of Lands, to whom a request was made for a grant of a sum of money, after explaining the object of the Association and its work. The Minister promised to give a grant of £10; also, a number of copies of the JOURNAL OF AGRICULTURE for distribution amongst bee-keepers, and to watch the progress of our work. The deputation thanked the Minister and retired.

On resuming work at the meeting rooms, Mr. McCormick moved—"That this Conference desires to express its thanks and satisfaction to the Minister of Lands for the help that he has given to the bee-keeping fraternity by the appointment of an expert to supervise the industry."—Carried unanimously.

Mr. McCormick moved a vote of thanks to the President for the way in which the Conference had been conducted.—Carried unanimously.

AGRICULTURAL GOSSIP.

(By J.W., in the *Australasian.*)

WINTER PASTURES.

Remarkable evidence is afforded by the operations at the Werribee Sewage Farm of the value of prairie grass for winter pastures. There is no pasture grass to beat it for winter growth. and, providing it be properly handled, none that can excel it either for fattening or for milk-raising.

THE VALUE OF PRAIRIE GRASS.

On the sewage farm about 2,300 acres have been sown down to lucerne and prairie grass. Of this area there are about 1,000 acres of prairie grass alone, and the balance is prairie and lucerne mixed. The lucerne, of course, ceased growing about the end of April, and from that time to the present no irrigation has been used, the sewage being turned down on to settling pits. The grazing capacity of the farm, therefore, during the period named, has depended on prairie grass alone, with the natural rainfall. The farm is carrying at the present time 12,185 sheep, or an average of over five sheep to the acre, besides 260 cows, 35 young cattle, and 100 horses. And, as a further instance of the value of this long-neglected but admirable pasture grass, it may be mentioned that 100 bullocks, purchased on the 3rd of December last at £7 10s. per head, were sold, in one line, on the 20th May, at £15, the net profit on the deal, after paying all deductions, amounting to £695. And these bullocks, during the whole of the fattening period, were confined to 130 acres of prairie grass alone. On another 36 acres, subdivided into two paddocks of 18 acres each, where the pasture is also composed of prairie grass alone, 20 milch cows have been running for months, and the feed is so plentiful that Mr. Lester, the manager, says the area would easily run another 10 head.

THE SECRET OF ITS SUCCESS.

Of course, one would naturally conclude that it is the fertilising power of the sewage which renders these astonishing results possible. It is obvious that it must be beneficial, but its use alone is not by any means the whole secret of success. It is the method of subdivision into small paddocks of 18 and 20 acres each, feeding down rapidly, and then removing the stock and giving the pasture a chance to renew its growth, which has contributed so largely to the success of both prairie grass and lucerne at the Werribee farm. Five to six hundred sheep are turned into one of these small paddocks at a time. They eat it down in a few days, and are then passed out, and the paddock closed up for three to four weeks, when the process can be again repeated. This is unquestionably the way to manage both lucerne and prairie grass to obtain the best results.

METHOD OF LAYING DOWN THE PASTURES.

Mr. Lester sowed down another 100 acres to pasture during the last autumn, and the method of doing so is worth noting for the benefit of those who have an opportunity of giving prairie grass a trial. After the land has been well ploughed and reduced to a fine tilth by cultivation, 2 bushels of prairie grass and 1cwt. of superphosphate to the acre are drilled in, and about 6lb. of lucerne seed broadcasted over it. And, notwithstanding the fact that for over a year sewage had been run over the land before it was broken up, there was a marvellous difference in the drill rows where the superphosphate had been properly dropped in its place and where by accident no manure was applied. In the one case the plants were bold and vigorous, and as green as celery-tops; in the other, spindly, pinched, and as red as a fox. These sowings were made at intervals from the middle of April till the middle of May; and as two of the heaviest frosts ever experienced at Werribee occurred after the young plants were up, and while numbers of them were still in the seed leaf, some anxiety existed as to how far injury would occur from this source. The most careful examination, however, shows that, beyond the check given to the unmanured drills, no serious harm was done to either the lucerne or prairie grass. Prairie grass seeds very freely, and in the plantation enclosures and in unused nooks all over the sewage farm it is spreading naturally with self-sown seed. It requires more frequent watering in summer than lucerne, and without watering would not do much at that time of year except in districts with a good rainfall, but for winter pastures almost all over the State it would be difficult to find a more suitable grass, where proper subdivision of the grazing paddocks can be undertaken.

AGRICULTURAL SEEDS.

There appears to be a good opening for enterprising farmers to turn their attention to the work of raising grass and other agricultural seeds. Except in a few lines like peas and beans, nearly all the seed the Victorian seed trade requires is imported—New Zealand, Great Britain, Germany, Japan, and the United States furnishing the chief supplies. Inquiries amongst leading seedsmen indicate that the seed trade in Victoria handles annually about 75 tons of lucerne seed, 120 tons of rape, 28,000 bushels of rye-grass, 5,000 sacks of cocksfoot, 1,200 sacks of prairie grass, 50 tons of sorghum, 5 tons of millet, 1,200 sacks of Canadian Wonder beans, and 500 sacks of Yorkshire Hero peas. The beans and peas are raised in the State, and most of the sorghum seed, a few hundred sacks of prairie grass, and a very small portion of the rye and cocksfoot. All the rest are imported. Japan sends a great deal of the rape and millet; the United States and the Continent most of the lucerne; New Zealand and Great Britain the grass seeds.

SEED IMPURITIES.

No serious attempt has been made by the Department of Agriculture to insist on a high standard of purity being maintained in seed distribution, yet the magnitude of the trade certainly warrants very earnest attention. In the last report of the Canadian Department of Agriculture, just to hand, the Minister points out that to deal with this important work a modern seed laboratory for testing the purity and vitality of seeds has been equipped by the department there. With the assistance of the district agricultural societies in all the provinces, over 50 samples of Timothy, alsike, and red clover were examined. Samples of the alsike clover showed as low a vitality as 46 per cent., and no less than 27,540 weed seeds to the lb.; the red clover, 25 per cent. of vitality and 8,775 weed seeds; and the Timothy, 73 per cent. of vitality and 42,930 weed seeds; so that purchased seeds are often a cause of filling the land with noxious weeds.

TIME TO SOW RAPE.

Several correspondents have recently asked what is the best time of year to sow rape. To this question I invariably give the answer that there is no time like the autumn, more especially when March rains are obtained. I have seen some fair crops of rape that were sown early in the spring, but they never gave the feeding results that follow an autumn sowing, and they seemed to be much more liable to the attacks of aphis. A distinct advantage in sowing rape in the autumn is that after it is heavily stocked during the winter, and eaten off closely, giving the paddock a few weeks' spell in the spring generally results in a second crop being produced, which will fatten another lot of sheep, and all that may then be left can be ploughed down as manure for the next crop. Many farmers in the neighbourhood of Ballarat adopt this practice, and it pays remarkably well, the profit in connection with the rape being large, while the succeeding crop is invariably good and clean. In a good many instances barley is sown with the rape, and this is found to be an excellent plan. The barley shelters the rape in its young stages, protects it from frost, seems to be of assistance in promoting root-growth, and the combined barley and rape constitute a splendid fodder for any kind of stock, but more particularly sheep.

STUDENTS FOR EXPERIMENTAL FARMS.

The Hon. the Minister for Lands has been pleased to approve of the following regulations in connection with the admission of students at the Experimental Farms:—

(1.) That the minimum age of students for admission shall be 16 years.

(2.) That students shall be required to pay a fee of 10s. 6d. per quarter, and to provide themselves with such bed linen and towels as they may require.

(3.) The Government will find bed, mattresses, washing utensils, board, and room.

(4.) Students to make their own arrangements as to washing their clothes.

(5.) The teaching will be a practical course of agriculture, the use of various farm implements, sowing, reaping, etc.; and students will be required to do physical work in all branches of farm labour.

(6.) Students whose work is not satisfactory may be dismissed at any time.

(7.) Agricultural books to be provided from which students can study.

For further particulars and application for admission, address the Director of Agriculture.

ALEX. CRAWFORD,
Acting Director.

Co-operation in the Purchase and Testing of Manures and Feeding Stuffs.

The following article has been taken from the *Journal of the Board of Agriculture*, England, and is strongly recommended to our recently organised West Australian Producers' Co-operative Society:—

"Probably the two principal considerations which frequently deter purchasers of fertilisers and feeding stuffs from having samples analysed are expense and a desire not to offend the seller. When small quantities of these articles are purchased the fees for analysing each lot may amount to a considerable proportion of the total cost of the goods. And the strong personal element which enters into the transactions of merchants and farmers, who have maintained for a long series of years business relations which were perhaps established by their fathers and grandfathers, often makes it a difficult and delicate matter for the buyer to do anything which would, however remotely, suggest want of confidence in the seller. But these considerations practically disappear in cases where co-operation for the purchase and testing of manures and feeding stuffs comes into existence. Expense is then reduced to a minimum, because the analysis of one sample is sufficient to test the purchases of all those who have obtained the same article from the same source at the same time. There are in England and Scotland at the present time about fifty or sixty associations which are in some degree co-operative, and which concern themselves with the purchase or testing of manures and feeding stuffs.

"The Perthshire Agricultural Society, which has a membership of about 500, exists, like most county societies, principally for the promotion of a show, but it has adopted a simple and efficacious method of protecting its members against fraud or overcharges in the purchase of manures and feeding stuffs. Under the arrangements made by the Perthshire County Council for administering the Fertilisers and Feeding Stuffs Act, purchasers of manures or cattle food can have samples analysed by the agricultural analyst for the county on payment of 5s., the remainder of the analyst's fee being paid by the county. The Perthshire Agricultural Society has arranged that any member may submit samples to the Agricultural analyst without payment, the 5s. fee for such samples being charged by the analyst to the society. At the close of the season particulars of the analyses made for members are printed and distributed to members.

"The Derwent District Agricultural Club affords a good example of a slightly different form of co-operation. Several useful purposes are kept in view by this club, but its main object is to afford protection to members in connection with the purchase of manures and feeding stuffs. Its membership is about 100. Members occupying over 50 acres pay an annual subscription of 10s. Those occupying less than 50 acres pay 5s., and all expenses of analysis are paid out of the club funds. Members of the club are obliged by their rules to give the club information as to their individual purchases of manures and feeding stuffs. Samples for analysis are selected by lot at the club meetings, which are held monthly. At these meetings the results of previous analyses are read out and discussed.

"The following rules are worth quoting:—

"'(5.) Every member shall use his best endeavour to give such information to the society as shall promote the interests of the society and its private members.

"'(33.) Any member having made such purchases shall be obliged, if asked, to hand over two fair samples of the article purchased to the club, and the club, if they see fit, shall submit the same for chemical analysis.'

"These two rules illustrate the manner in which the difficulty above mentioned—*i.e.*, risk of giving offence to the seller—may be to a great extent removed by co-operation. If the club insists on the production of an invoice under Rule 5, or the taking of a sample under Rule 33, the merchant whose goods are sampled cannot make the sampling a personal matter between himself and the member who complies with the rules of the society.

"The samples taken by this club are submitted to a private analyst. In the case of a society forwarding samples to the official analyst of the district, Rule 33 would require modification.

"The Central Cornwall Farmers' Association, which has about 150 members, exists for the co-operative purchase of manures. The only subscription is a fee of 1s. 6d. per ton on the quantity of manure ordered. This fee is intended to cover the working expenses of the Association.

"The procedure is as follows:—In November each year a circular letter is sent to the subscribers of the previous year announcing the date of the annual dinner and meeting of the association, and enclosing a report of analyses of manures, showing the percentages of valuable ingredients guaranteed in the manures purchased through the association, and the percentages found by the analyst of the association. At the dinner money recovered by the association in respect of any deficiences in the guaranteed constituents of manures purchased by them is paid over to the members concerned.

"At the meeting the committee of management for the year is elected, and the committee proceed to decide what manures shall be procured during the coming season and the dates on which the manures shall be delivered.

"The commiteee is rather large, consisting of about thirty-six members, but as the chief work of the committee is to decide what manures shall be purchased, and the wishes of the members of the association may be diverse, a large committee is probably essential to the satisfactory working of the association.

"Immediately after the meeting a second circular is sent to the subscribers informing them of the decision of the committee as to the kinds of manures to be procured and the dates of the deliveries, and enclosing an order form, a copy of which is given on the next page.

"As soon as the quantities of various kinds of manures required have been approximately ascertained, tenders are invited by advertisement in the Press and by notices addressed to firms who have supplied the association in past years.

"The following extract, taken from a recent notice to manure merchants, shows the terms on which purchases are made:—

"'The dissolved bones shall contain not less than 20 per cent. of soluble phosphate, 13 per cent. of insoluble phosphate, and 1½ per cent. ammonia; such insoluble phosphate and ammonia to be derived from the raw bone used in its manufacture, and 2s. 3d. per unit will be deducted for every unit under 20 per cent. of soluble phosphate, 1s. 1d. for every unit under 13 per cent. of insoluble phosphate, and 12s. for every unit, or 1 per cent. (and so in proportion for any less quantity than a unit) under 1½ per cent. of ammonia.

"'The superphosphate to contain 26 per cent. of soluble phosphate, and 2s. 3d. per unit will be deducted for every unit under 26 per cent. soluble.

"'FORM No. 1.

"'To the Committee of the Central Cornwall Farmers' Association.

"..........................day of..........................1901.

"'GENTLEMEN,—I request that you will enter my name in your list of subscribers for Manures, as follows:—

"'To be delivered from 24th February to 15th March, at Wadebridge.

..............tons ground bones, ¼-inch and dust together
..............tons bone meal
..............tons dissolved bone
..............tons superphosphate
..............tons nitrate of soda
..............tons sulphate of ammonia
..............tons basic slag.

"'To be delivered from 1st to 24th April, at Wadebridge.

..............tons ground bones, ¼-inch and dust together
..............tons bone meal
..............tons dissolved bone
..............tons superphosphate
..............tons nitrate of soda.

"'To be delivered from 15th May to the 7th June, at Wadebridge.

..............tons ground bones, ¼-inch and dust together
..............tons bone meal
..............tons dissolved bone
..............tons superphosphate.

"'I enclose........................being the fee of one shilling and sixpence per ton, and

"I am, Gentlemen,
"Yours truly,

"'The nitrate of soda must be 95 per cent. pure nitrate of soda; deductions will be made if not up to this guarantee. The committee reserve the right of separating the nitrate of soda from contract.

"'The ground bones to be a genuine sample of pure raw bone *¼-inch and dust together* guaranteed to contain not less than 45 per cent. of tribasic phosphate of lime, and to yield not less than 4½ per cent of ammonia, and 1s. 6d. will be deducted for every unit under 45 per cent. of tribasic phosphate, and 12s. for every unit under 4½ per cent. of ammonia (and so in proportion for any less quantity than a unit under 4½ per cent of ammonia).

"'The bone meal to be a genuine sample of pure raw bones, guaranteed to contain not less than 48 per cent. of tribasic phosphate of lime, and to yield not less than 4½ per cent. of ammonia, and 1s. 1d. will be deducted for every unit under 48 per cent. of tribasic phosphate, and 12s. for every unit under 4½ per cent. ammonia (and so in proportion for any less quantity than a unit under 4½ per cent. of ammonia).

"'The merchant will be required, at his own expense, to enter into a legal contract (to be approved by the association) to supply the manures in accordance with this circular.'

"On the arrival of the cargo samples of manure for analysis are taken by an agent of the manufacturer and the agent of the association, and forwarded to the analyst of the association. If the analyses given by him are not satisfactory to the manufacturer, the latter is at liberty to have a further sample analysed at his own expense.

"This association has a slight advantage in connection with the sampling of consignments in that their district lies round a seaport, so that their purchases arrive by boat, and can be sampled before distribution takes place. In the case of other similar associations in inland districts the manufacturers despatch the goods by rail direct to the members, and such associations have to content themselves with sampling a small number of the consignments after delivery to their members.

"It is the practice of some associations to cause samples to be taken in the manner required by the Fertilisers and Feeding Stuffs Act, and send them to the official analyst appointed under that Act for their district, but others retain the services of a private analyst. The advantages of sending samples to an official analyst are as follows:—

"(1.) Samples taken under the Act and submitted to the official analyst are analysed with special care, in view of the fact that the reports upon such samples are more likely to be made the basis of legal proceedings than reports on samples submitted privately.

"(2.) In consequence of the responsibility attaching to the analysis of samples under the Act, the fees received by official analysts in respect of such samples are comparatively high, but the proportion of the fee payable by the person or society sending in a sample generally amounts to a very small sum. Therefore, by submitting samples under the Act, the most reliable analyses are obtained at a very small cost.

"(3.) By submitting samples to the official analyst the society, besides gaining the above advantages for themselves, assists the authorities to carry out the intention of the Act, by discovering and dealing with any fraud that may be in existence."

A GREAT POULTRY FARM.

Said to be the Largest of its kind in the World.

In Shelby county, Ohio, is situated the largest chicken and egg plant in the world. It is further distinguished from all other poultry houses in five ways—first, it produces for the market only, caring nothing for fancy breeds or other side lines; second, it is operated on an absolute system; third, it never loses a chicken by disease; fourth, it produces unfertile eggs; fifth, and most important, it is based on "kindness."

The daily output is 200 dozen unfertile eggs, which sell at an advance of 15 cents. over the market price, never less than 30 cents; and 330 one-and-one-half-pound broilers or one-half-pound "squabs," both unequalled for tenderness, quality, and flavour. There is no direct competition, business is on a strictly cash-in-advance basis, the demand is constant the year round, and the system is perfect.

How was it all done? The owner must be an old hand, wise in poultry lore. On the contrary, his venture is only a few years old, and he says that he doesn't know anything about the chicken business—that the only thing he goes by is plain, everyday common sense. The inference is that he must have a good deal of it.

The Hatchery.

The plant divides into two separate industries—one producing chickens, the other unfertile eggs. Let us follow the former from the beginning. In a building by itself are 900 Plymouth Rock hens in sixty pens, fifteen to a pen, one rooster to fifteen hens. They are selected, not according to points, but for health and strength only. To avoid favouritism, the roosters are changed once a week. The hens lay all the year through, this being accomplished by watching their diet. The body heat of a hen must be 103 degrees before she can hatch or wants to sit. This high temperature is caused by fever, and if the fever is prevented the hen will continue to lay and not get "broody." At the first sign of it (it does not happen often), the hen is changed from corn to a less heating diet in small quantities, and at night is kept in the damp yard that opens off every pen. This "cools her off," and she begins laying once more. So, when the feed cart goes down the long aisle between the two rows of pens it returns laden with fresh eggs.

These eggs are taken to a room in the basement of the main building, which contains 30 30-day incubators of 300-egg capacity each. Two incubators are started one day, one the next, so that every day would average 450 chicks if all hatched. Very few fail. At the end of seven days a lamp test is made, and unpromising eggs taken out and sold to local bakers. Seven days later another test is taken. After hatching, the chicks are left in the machines one day, for their systems to dry out.

The Nursery.

A year-round average of 330 chicks goes up every day in a little elevator to the "nursery." Here is a horseshoe of 30 pens, gradually increasing in size. The chicken never spends two days in the same pen, but throughout the entire system moves up one pen every day, the entire change requiring only 15 minutes. Thus the system is on a most exact arithmetical foundation.

During the first 36 hours in the "nursery" the chicks receive no food. The floors of the first seven pens are covered with removable cloth, and there is no sand that the chicks can pick up and so injure their tender organs. The proprietor explained that a chicken "has no sense," and, not having food, would pick up the sand. So until they have been half a day in pen No. 2 they do nothing but run around and dry out some more. The first food is a bare pinch of finely-ground corn placed on a board. The chicks learn to go to the board for food, and it is always found there and nowhere else. Thus no food is wasted and the amount used is known exactly. At pen No. 8 the cloth is replaced by sand on the boards. Water is furnished from a self-feeding can with a narrow trough around it. Gentle heat comes from hot-water pipes a foot or so from the floor over one end of the pen, the distance from the floor being increased every ten pens. The ground corn diet is increased gradually from pen to pen until when they reach pen No. 30 a handful is given three times a day for the entire brood.

On the thirty-first day of their lives the chicks are transferred from the "nursery" to the "horseshoe," a similar but far larger building, under the same roof, 840 feet in length, the end of it being right across the driveway from the starting point. The pens are 60 in number, larger, and each opens into an outdoor yard. On the theory that a chick when cold will crouch on the ground, expecting heat from above, "mothers" are provided. In each pen is a large metal disc, which reflects down the heat from two natural gas burners under it, the discs becoming higher from the ground in every pen. This keeps the temperature at about 65 degrees, 15 degrees lower than in the "nursery." Supplementary heat can be furnished from steam pipes, and ventilation is afforded by cold air ducts every 37 feet. The population of the "horseshoe" averages 21,000, that of the "nursery" 9,000, making a total of 30,000 chicks of all ages.

Until they are half-way around the "horseshoe"—60 days old—the chicks are never allowed to roost, so that they rest on the ground, and gain in shape and fullness of breast. When 60 days old, they weigh one-half pound, and many are then sold to fashionable hotels as "squabs," never bringing less than 5dol. a dozen. At pen No. 70 cement floors begin, and the diet, hitherto designed to give only health and strength, is changed from ground corn to mash in order to produce weight and bulk. At the end they are 90 days old, and average 1½lbs. There has been no disease; they are tender, plump, and delicate, the finest broilers on the market, and worth from 5dol. to 6dol. and more a dozen.

THE KILLING ROOM.

They move on to the killing room, 75 in a coop. A man strings them up by the feet, runs a lance into a blood vessel in the roof of the mouth, which causes copious bleeding, and then kills them by piercing the brain. The latter is an ingenious device, for it relaxes the whole system, so that the feathers come easily from the exquisitely tender skin without breaking it. After being "roughed," the bird is "pinned" of its smaller feathers; head, feet, and insides are left, and the whole remains through the day in running water, in order to remove the animal heat "by degrees." After spending the night in ice water, the broiler is ready for shipment.

THE "EGG-HOUSE."

The "egg-house" is a separate building, 537ft. long, with 60 pens, each containing 50 brown, buff, or Leghorn hens, selected for health, strength, and laying qualities, not for breeding. From these 3,000 hens come 200 dozen unfertile eggs a day. The production of unfertile eggs is peculiar to this one plant, where was first made the experiment of producing eggs from hens that have never been exposed to a rooster. Of course, an unfertile egg will not hatch, but it is far superior for market purposes, having a delicate flavour and unusual keeping properties. The yolk is a light yellow. Here, as in the "hatchery," the most exact system is in force, and the same methods of preventing brooding are followed. The market is with dealers who cater to the fashionable trade of the larger cities.

THE FOOD PROBLEM.

Of course, the food problem is extremely important. Here, as everywhere, so absolute a system prevails that even the size of an egg can be determined by feeding lime (shell) elements at a certain time. Finally cracked corn, mash and green-bone dust are used in both lines of the business. In the yards is scattered charcoal to prevent sour stomach, to which the proprietor attributes all diseases of chickens.

The mash is made by placing on a four-inch layer of dry clover a two-inch layer of unhulled oats and turnips, made mushy and at the boiling point from steam; on this is placed a two-inch layer of bran, with a dash of hot salt water; then four inches of dry clover; then oats and turnips, as stated, and lastly two inches of middlings. By the time this has cooled, the moisture has been taken up by the dry clover, and the whole is thoroughly mixed. An important point is that the clover must be sweated and the oats steamed, not boiled, so that none of the ingredients are steeped out of them. Roughly speaking, the food plan is that the corn and oats make the meat of the egg and give strength to the chick; the bone is for the egg film, the bran and clover for the lime of the shells, and the turnip and potato for a relish. By watching results and studying experiments, the correct proportion of each element is learned for any one case. One may know just what materials are needed for a pie, but it does not follow that one can make a good pie just from that knowledge. The total feed bill amounts to only 1,200dol. a year, from which the plant raises over 100,000 broilers and produces 875,000 unfertile eggs.

THE GREAT SYSTEM.

The great system is carried out in every detail. There is an engine-room and heating apparatus for steam and hot water, a laundry for the "nursery" flood cloths, a corn grinder, mash press, mash boiler, a shaver for potatoes and turnips, a chopper for clover, a provision cellar; and also, by the way, a great loft in which the proprietor intends soon to place 6,000 pigeons to produce 1,000 squabs a day.

But the one thing more than any other to which the proprietor attributes his phenomenal success is the common sense of "kindness." He is a practical philosopher. He noted that when a man goes to his dinner contented and free from worry he enjoys the meal, digests it easily, and profits by it. If he is worried, tired, or ill at ease when he eats, he neither enjoys, digests, nor profits. This common-sense proprietor buys many wild Texas steers in Chicago every spring and ships them to his quiet, blue-grass Ohio farm. They eat nothing except grass, but day by day his men work at taming them. Gradually the steers lose their fright and wildness, become contented and happy, and in the fall are sold back to Chicago at a heavy profit. By grass and kindness he has added from 100 to 200 pounds to each head. He has tried the same plan successfully with sheep. He makes it the foundation of his poultry and egg plant. During the three months of their lives his chicks never know a minute of fright or rough usage. They find only gentleness, quiet, and content, and therefore they thrive. No sudden movement or noises are permitted. If an employee approaches a pen without first calling "Chick, chick" he loses his place. Upon such "little" things as these is built the largest poultry and egg plant in the world.

FREAK HEN AVERAGES TWO EGGS A DAY.

The following is clipped from our last American files:—A special to the Press from Morristown, N. J., says: Charles Helmke of Green Village, has a hen which lays two eggs a day. The hen has been watched carefully for the last month and has not varied from that record since she was placed in a coup by herself. On two days she has laid three eggs each, but on the following day she laid but one.

This hen is not a freak, but the result of breeding experiments carried on for three years by Helmke. He had the idea that it would be possible to produce a breed of hens that would lay every day in the year. He even thought it possible to produce hens that would lay two eggs a day. But he did not know how near he was coming to the desired result until March 1st, when he placed this hen in a coop by herself for observation. Since that time she has laid sixty-eight eggs. He believes he has produced the greatest hen for commercial purposes in the world.

BUTTER v. OLEOMARGARINE.

Butter is better than oleomargarine mainly by reason of its flavour, or aroma. Butter which is destitute of this quality is worth no more than oleomargarine or process butter, and should not sell for a higher price. Butter substitutes can be perfect in grain, salt, and colour. The flavour of butter they cannot get. In scoring butter at competitive exhibitions flavour is always allowed 50 per cent. out of a possible 100. The aroma of butter is a flavour created by beneficient bacteria which inhabit cow's milk. They are less rugged than their fellow bacteria of the foul smells, and if these, by bad management, are given a fair start they will take possession and destroy the product. We have learned by long experience the conditions under which the good bacteria thrive and multiply and the others perish. One way much employed is to use a "starter" for ripening the cream. A starter is simply a little cream containing only such bacteria as it is desired to have multiply. The "pure culture" on which it is based must be obtained from some laboratory. It is, of course, quite possible to make the best of butter without a starter, but its use adds some certainty to the process. But no starter can make good butter from cream already infested with pernicious bacteria. The cheap butter which is found so abundantly in all markets is butter which has no aroma. It is no better than oleomargarine. F. A. Leighton, writing on this subject in Chicago *Dairy Produce*, says:—

"Aroma is that delicate creamy flavour which you get in thick, rich cream, before the different species of bacteria get in their work. It is a flavour that suggests roses. A flavour that leaves a taste behind that creates an appetite for more of the same flavour. It is a flavour that does not suggest cow barns, old milk, dirty creameries, or house odours. It is the flavour which nature puts into the cow's milk. Aroma is the only feature which distinguishes the gilt-edge creamery butter from the lowest grades. The best of butter can be perfect on grain, colour, and salt, and only be worth three cents (1½d.) a pound—the price of grease on the market; but let it be perfect in aroma and flavour, and the price jumps to 25 cents. (1s. 0½d.)"

Mr. Leighton continues: "If I was to hire a butter-maker, I think I would hire him in this way: If his butter was perfect in grain, I would give him $5 (20s. 10d.) a month; if perfect in colour, $5 (20s. 10d.) more. If a clean package, $5 (20s. 10d.) more. If perfect on salt, $5 (20s. 10d.) a month. This would give him $20 £4 3s. 4d.) a month—the wages of an ordinary farm hand. And all he would be worth. If his butter was perfect on flavour and aroma, I would add $80 (£16 13s. 4d.) a month more. And if he had a knack of getting on with the patrons and keeping them happy and contented, I would increase his wages to $25 (£5 4s. 2d.) more. This would make him $125 (£26 0s. 10d.) a month—not a cent too much. He could get this anywhere."

HANDBOOK OF HORTICULTURE AND VITICULTURE.

We are pleased to announce that the *Handbook of Horticulture and Viticulture* by Mr. A. Despeissis, who has spent the last eighteen months in its compilation in order to bring it up to date, will be published in a few days. There will be two classes of binding, one in paper covers at 1s. each; the other in stiff boards at 2s. 6d. each. Those requiring a copy—and we take it that every settler, fruitgrower, or orchardist should have one—should send in an application at once, accompanied by the amount, to the Director of Agriculture, Perth.

DISTRIBUTION OF SEED.

The Acting Director of Agriculture wishes it known that those who desire samples of salt-bush seed, or tobacco seed, can have the same by applying to the Department.

DALGETY'S REPORT.

Messrs. Dalgety & Co., Ltd., Wool and Grain Brokers, report as follows in connection with their Perth and Fremantle markets for the week ended 24th July:—

Chaff.—The opening markets were heavily supplied, chaff coming forward quite as freely as during the previous week. The recent decline in values, however, seems to have exercised some influence on supplies from the country, as during the last few days there was a slight decrease in fresh arrivals. The total offerings for the week were in excess of the rate of consumption, but buyers were more inclined to operate. The market was extremely sensitive, values fluctuating even during the course of a day's sale; but, on the whole, values (more especially during the last two days) were slightly firmer than the previous week's rates. The offerings consisted principally of oaten, medium wheaten, and inferior, there being very little prime green wheaten chaff forward. Very many truck loads of prime chaff were spoiled by the presence of small quantities of wet and damaged chaff, much to the detriment of values.

We sold the following trucks of chaff at auction:—

AT PERTH.

Truck No.		Per ton.		
		£	s.	d.
4954,	ex Wagin—Prime wheaten	6	17	6
2510,	ex Newcastle—Dry oaten...	5	5	0
1816,	ex Pingelly—Prime wheaten	6	10	0
514,	ex Wagin—Headed oaten...	3	17	6
4424,	ex Greenhills—Prime wheaten	6	17	6
6029,	ex Greenhills—Prime wheaten	6	15	0
857,	ex Wagin—Prime wheaten, slightly mixed	6	7	6
4023,	ex Narrogin—Oaten	6	5	0
6134,	ex Wagin—Wheaten mixed	5	0	0
5215,	ex Woodanilling—Prime wheaten	6	15	0
6222,	ex Moojebing—Dry oaten, slightly damaged	5	5	0
143,	ex ———, Prime wheaten	6	15	0
4737,	ex Beverley—Prime oaten	5	0	0
4973,	ex Mt. Kokeby—Dry oaten	5	7	6
4861,	ex Wagin—Good wheaten	6	0	0
2606,	ex Wagin—Prime wheaten	6	12	6
3555,	ex Tammin—Prime wheaten, slightly smutty...	6	12	6
3811,	ex Narrogin—Prime wheaten	6	10	0
5992,	ex Gilgering—Prime wheaten, badly cut	6	10	0
5185,	ex Newcastle—Oaten, dry...	5	5	0
5998,	ex Moojebing—Prime oaten	6	0	0
3128,	ex Brookton—Prime wheaten	6	17	6
4000,	ex Brookton—Prime wheaten	6	17	6
2327,	ex Wagin	5	15	0
1182,	ex Newcastle—Dry oaten...	5	7	6
4184,	ex Newcastle—Straw	4	0	0
2523,	ex Wagin—Prime oaten ...	6	12	6
3823,	ex Wagin—Mixed wheaten, weedy	4	12	6
2484,	ex Brookton—Prime wheaten	6	10	0
3868,	ex Brookton—Prime wheaten	6	12	6
2584,	ex Brookton—Prime wheaten	6	12	6
1195,	ex Newcastle—Dry oaten ...	5	10	0
1159,	ex Gilgering—Prime wheaten	6	7	6
1092,	ex East Northam—Prime wheaten	6	15	0

Truck No.		Per ton £	s.	d.
5447,	ex East Northam—Prime wheaten	7	0	0
5422,	ex East Northam—Prime wheaten	7	0	0
3892,	ex Gilgering—Good wheaten, badly cut	6	0	0
519,	ex Gilgering—Good wheaten, badly cut	5	17	6
2533,	ex Brookton—Prime wheaten	6	17	6
2470,	ex Brookton—Prime wheaten	6	5	0
4532,	ex Mt. Kokeby—Dry oaten	5	7	6
946,	ex York—Medium wheaten	6	2	6

AT FREMANTLE.

2007,	ex Narrogin—Prime oaten	6	10	0
5337,	ex Gilgering—Prime wheaten	6	15	0
1103,	ex Newcastle—Dry oaten, damaged	4	10	0
5322,	ex Edward's Crossing—Oaten	5	17	6
5425,	ex Mt. Kokeby—Dry oaten	5	0	0
3690,	ex Mt. Kokeby—Dry oaten	5	2	6
3675,	ex Newcastle—Dry oaten	5	7	6
1158	ex Narrogin—Prime wheaten	7	2	6
1127	ex Wagin—Medium wheaten	6	2	6
4166	ex Newcastle—Dry oaten	5	10	0

Fremantle, being a small market, is still suffering from heavy supplies. During the week we sent into store 10 trucks.

Oats.—Algerians, locals, 3s. 10d. to 4s. and 4s. 1d. per bushel. Values are slightly weaker in sympathy with decline in the Eastern States.

Barley.—No local offering. Imported "Chevalier," 5s. to 5s. 1d. per bushel.

Hay.—Limited inquiry. Nominal value prime green wheaten, £7 10s. per ton. Local grown oaten, suitable for racehorse feed, none offering.

Pressed Straw in bales, £5 5s. per ton. Demand restricted; supplies limited.

Wheat.—Prime local milling in limited quantities, 5s. 7½d. to 5s. 8½d., f.o.r. at Perth and Fremantle. Imported, nominal value 5s. 8d. per bushel, f.o.r. Fremantle.

AT KALGOORLIE.

This market has been slightly ahead of Perth and Fremantle, and has not been similarly rushed with chaff, although perhaps the arrivals have been slightly in excess of the rate of consumption. Most of the chaff to this centre at the present time is purchased privately in the country, but auction sales are gradually coming more into favour. During the last week at this centre we sold about 15 trucks and the following prices were realised:—

Extra prime green wheaten chaff	£8 15s. per ton.
Prime green wheaten chaff	£8 10s. to £8 12s. 6d. ,,
Prime wheaten chaff	£8 to £8 5s. ,,
Medium chaff	£7 to £7 5s. per ton, according to quality.

The demand at this centre is restricted solely to prime chaff.

Hides, Skins, Etc.

Messrs. Dalgety & Co., Ltd., report having held their usual sale on Friday, 24th July, when supplies were lighter than usual. Values for sheepskins were again irregular, the reason being that many consignments, owing to the wet weather, were marketed in damp condition, and also the effect of the latest cable reports. Pelts off shears are still in keen demand at quotations. Heavy hides continue at the reduced values reported last week, but light weights are still eagerly sought after. Tallow and fur skins remain unchanged. Prices:—

Sheepskins—

Merino super., 6¾d. to 7¼d. per lb. ... Crossbred super., 7¼d. to 7½d. per lb.
" medium, 6d. to 6½d. per lb.... " fine, 6¾d. to 7d. per lb.
" inferior, 5¼d. to 6d. per lb.... " medium, 6d. to 6½d. per lb.
" pelts, 4½d. to 5d. per lb. ... " coarse, 5d. to 5¼d. per lb.
Crossbred pelts, 4d. to 4½d. per lb.

In all classes where pelts are sun-dried, weevil-eaten, cut, torn, or perished, values are 1d. to 1½d. below these quotations.

We have received the following cablegram from our London office, dated the 23rd inst.:—"At the auction sale to-day prices for Merino skins were from par to ⅛d. per lb. lower. Crossbred skins were from par to 0¼d. per lb. higher."

Hides—

Prime, stout, and heavy, 5½d. to 6d. per lb.... Prime light, 4¾d. to 5d. per lb.
Medium heavy, 5d. to 5¼d. per lb. ... Medium light, 4½d. to 4¾d. per lb.
Extra light, 4d. to 4½d. per lb.

Attention to flaying and preparation for market is most necessary as most damaged lots rule fully 1½d. per lb. below quotations.

Opossum Skins—

1st black, 25s. to 28s. per doz. ... Super greys, 11s. to 13s. per doz.
2nd " 12s. to 16s. " ... Ordinary greys and reds (mixed), 7s. to 8s. 6d. per dozen, average.

Kangaroo Skins—

Grey fresh, ½lb., 1s. 4d. to 1s. 6d. per lb. ... Red fresh, ½lb., 1s. 2d. to 1s. 4d. per lb.
" ¾lb. to 1½lbs., 1s. 9d. to 2s. per lb. ... " ¾lb. to 1½lbs. 1s. 9d. to 2s. per lb.
" 2lbs., 1s. 8d. to 1s. 10d. per lb. ... " 2lbs., 1s. 6d. to 1s. 8d. per lb.
Perished lots, 1s. 3d. to 1s, 6d. per lb.

Tallow—

Best mixed, 27s. 6d. to 28s. per cwt.... Medium mixed, 26s. to 27s. 6d. per cwt.
Inferior mixed, 23s. to 25s. per cwt.

Chaff.—There was a considerable falling-off in the arrivals of chaff during the week, the consequence being that throughout prices were firm, and showed no tendency to recede. There was a good deal of dry oaten chaff offering, but the supplies of prime green wheaten were very contracted, the consequence being that all such lines offering met with keen competition. Generally the tone of the market was more healthy, and all lots submitted for auction met with spirited bidding.

We sold the following trucks of chaff:—

AT PERTH.

Truck No.		Per Ton. £	s.	d.
3885,	ex Gilgering—Good wheaten, badly cut	6	5	0
3079,	ex Moojebin—Oaten	5	10	0
2669,	ex East Northam—Prime green wheaten	7	0	0
2604,	ex East Northam—Prime green wheaten	7	5	0
4214,	ex Woodanilling—Prime green wheaten	7	5	0
3396,	ex York—Prime green wheaten	7	0	0
5297,	ex East Northam—Prime green wheaten	7	2	6
4985,	ex East Northam—Prime green wheaten	7	2	6
3951,	ex Mt. Kokeby—Dry oaten	5	7	6
3981,	ex Wagin—Mixed wheaten	5	5	0

Truck No.		Per Ton		
		£	s.	d.
959,	ex Woodanilling	7	2	6
5530,	ex Gilgering—Good wheaten, little dry	7	2	6
1106,	ex Pinjarrah—Oaten	6	10	0
5317,	ex Brookton—Prime green wheaten*	6	0	0
5948,	ex East Northam—Prime green wheaten	7	5	0

AT FREMANTLE.

Truck No.		Per Ton		
		£	s.	d.
1484,	ex Newcastle—Dry oaten	5	10	0
809,	ex Newcastle—Dry oaten	5	7	6
23,	ex Dongara—Cow chaff	3	2	6
1144,	ex Mt. Kokeby—Dry oaten	5	5	0
3677,	ex Newcastle—Dry oaten	5	5	0
2335,	ex Newcastle—Dry oaten	5	10	0
1112,	ex Narrogin—Prime green wheaten	7	5	0
369,	ex Newcastle—Dry wheaten	5	10	0
352,	ex Narrogin—Inferior wheaten	4	15	0

* The sale of this was unfortunately marred by the presence of a few bags of mixed chaff.

Attention to the sheeting and grading of chaff is most necessary, as many truck loads of chaff are sold at low rates owing to neglect in either of these directions. During the week there has been a better all round inquiry for chaff, and we effected sales privately of 50 tons of prime and 30 tons of inferior at satisfactory rates.

Oats.—Business is limited; very few locals being available. Nominal value prime feed ranged from 3s. 10d. to 4s. 1d.

Barley.—No local offering; "Chevalier," 5s. per bushel.

Hay.—Restricted inquiry. We effected sales of prime green wheaten at £7 10s. per ton. There is a slight demand for good locally grown oaten hay. Pressed straw £5 5s. per ton. Supplies limited.

Wheat.—Sales of local were effected at prices ranging from 5s. 7½d. to 5s. 8½d., f.o.r. at Perth and Fremantle, according to quality. Imported wheat, nominal value 5s. 8d. per bushel, f.o.r. Fremantle.

Chaff.—Arrivals come forward very slowly, the consequence being that right through the week there has been an active demand for all classes, heavy truck loads meeting with keen competition. Prime green wheaten chaff was by no means plentiful, whilst supplies of oaten were heavier.

We sold the following trucks of chaff:—

AT PERTH.

Truck No.		Per ton.		
		£	s.	d.
885,	ex Brookton—Prime green wheaten	7	5	0
2734,	ex Brookton—Prime green wheaten	7	7	6
6064,	ex Gilgering—Inferior wheaten	5	15	0
14A,	ex Muchea—Good oaten	6	5	0
6176,	ex East Northam—Prime green wheaten	7	5	0
5209,	ex East Northam—Prime green wheaten	7	5	0
3756,	ex Brookton—Prime green wheaten	7	10	0
4569,	ex Newcastle—Prime oaten	6	5	0
6028,	ex York—Medium wheaten	6	15	0
5409,	ex East Northam—Prime wheaten	7	2	6
2580,	ex Newcastle—Medium oaten	5	15	0
4397,	ex Newcastle—Medium oaten	6	0	0

AT FREMANTLE.

Truck No.		Per ton £	s.	d.
4571,	ex Narrogin—Prime green wheaten	7	10	0
2601,	ex East Northam—Prime wheaten	7	2	6
965,	ex East Northam—Prime green wheaten	7	7	6
4754,	ex York—Prime green wheaten	7	10	0
5194,	ex Beverley—Prime green wheaten	7	7	6
5333,	ex Serpentine—Medium oaten, wet	5	10	0

Oats.--Business is limited; very few locals available. Nominal value prime feed, 3s. 10d. to 4s. 1d.

Barley.—No local offering; "Chevalier," 4s. 11d. per bushel.

Hay.—Very little offering; demand limited. Prices are slightly weaker, and we sold 20 tons of prime wheaten hay at £6 15s. per ton, York. Oaten Hay—Very little available. We sold one truck at Fremantle at £7 2s. 6d. per ton.

Wheat.—Sales of locals were effected at prices ranging from 5s. 7½d. to 5s. 8½d., f.o.r. at Perth and Fremantle, according to quality. Imported Wheat—Nominal value, 5s. 8d. per bushel, free on rails; very little offering.

GARDEN NOTES FOR SEPTEMBER.

By PERCY G. WICKEN.

September may be said to be the Spring month of the year, and after the plentiful supply of rain which has fallen during the past few months the warmer weather will cause all vegetation to make a more rapid growth. In most districts the frosts—which have been very few this year—will, in all probability, be over, and the more tender plants may be planted out without the risk of losing them. Any plants that have been raised in seed-beds and under glass may be planted out in the open. No time should be lost in planting out as much ground for vegetables and summer fodder crops as possible, as in our Eastern districts the ground very soon becomes dry, and the rainfall ceases early, and unless the plants are enabled to obtain a good root-hold before the weather becomes hot they have very little chance of making a satisfactory growth afterwards. Break up and work the land as deeply as possible, as this enables the soil to retain a large supply of moisture; but this does not necessarily mean to bring all the sour subsoil to the surface. The subsoil may be well broken up and allowed to remain under the surface soil; it will then sweeten gradually, through the air and water being enabled to penetrate through it. The surface soil requires to be worked up as finely as possible, so as to enable the young seedlings to easily penetrate it. Well-rotted stable manure dug into the ground is the best manure that can be applied, but where this is not available, bone-dust or boiling down refuse is the best manure to use for a base, and this should be lightly dug in near the surface. The more highly soluble manures are better applied as a top-dressing when the plants have started to grow, or, better still, mixed with water in the form of liquid manure. The urine from the farm stables is very valuable for the vegetable garden, and if arrangements are made to drain the stables and run this liquid into a pit, from whence it can be pumped into a tank, it would prove profitable to the gardener. The most succulent and crisp vegetables are those that are quickly grown, as when their growth is checked by want of moisture, food, and the attacks of insect pests they become fibry and tough. Caterpillars and grubs of numerous varieties will, no doubt, soon become troublesome, and as these mostly eat the leaves of the plant, they may be kept in check by spraying the plant with a solution of Paris green—one ounce to ten gallons of water. The Paris green should first be mixed into a paste, and the water poured on to it. As this is an arsenical poison, it must not be applied to vegetables for two to three weeks before they are ready for use.

ASPARAGUS.—In the cooler districts of the State the roots may still be planted, but in most parts the shoots will have started into growth.

ARTICHOKES should be largely planted out this month. They will do in poor soil, are prolific, and valuable as a vegetable as well as for stock-feed. Sow in rows three feet apart, and 18 inches in rows.

BEANS (FRENCH) can be sown in almost all parts of the State. They are one of our best vegetables, and always in demand. The dwarf varieties are generally grown, as they do not require staking; but the runner varieties are very prolific. It is best to sow a row or two every week from now on, so as to keep up a succession.

BEET (SILVER) should be largely sown this month. This is a valuable plant, and will give a liberal supply of green leaves all through the summer, and is very little affected by dry weather. The leaves are succulent, and make a welcome addition to the table. Plant out in rows about 30 inches apart, and 12 inches apart in the rows.

BEET, RED.—The plants may either be raised in a seed-bed or planted direct into the drills, which should be about 18 inches apart, and the plants six to eight inches apart in the drills. Fresh manure should not be applied to root-crops. Soak the seed for 12 hours before sowing.

CABBAGE.—Put out a little seed in a box or seed-bed for future use, and plant out all plants that are strong enough. The St.

John's Day is a good variety for summer cropping. Cabbage require plenty of nitrogenous manure, and a good dressing of sulphate of ammonia, applied either as a top-dressing or as a liquid manure, will generally prove profitable.

CUCUMBERS.—In most districts these plants may now be put out in the open, although they may at first require shading at night. The ground should first be dug or ploughed, and the holes worked up to a depth of about 18 inches and three feet in diameter, and stable manure well mixed with the soil; these holes should be from six to eight feet apart each way. Sow from eight to 12 seeds in each hole. When the plants are well up thin out to five or six plants. Cutworms are very troublesome to the crop at this stage, and will require to be well looked after.

ROCK MELONS.—Treatment same as for cucumbers.

ONIONS.—Plant out all seedlings from the seed-bed, and keep the beds free from weeds. Sow a little seed for future use.

PEAS.—In the cooler districts some of the quicker-growing varieties may be sown.

POTATOES.—The main crops should all be planted by this month, and if not already in should be planted at once. Recent experiments demonstrate that three eyes to each cutting, and good large pieces, are the best for planting. The seed potatoes should be healthy and free from scab. Sow in rows 30 to 36 inches apart, and 15 inches apart in the rows. They require a manure containing a liberal supply of potash.

PUMPKINS AND SQUASHES.—The early varieties should be sown as soon as frosts will permit. The hills should be worked the same as for cucumbers, and all couch grass and weeds taken out, and a handful of superphosphate worked lightly into each hill. For the bush varieties the hills may be six or eight feet apart each way, while for the strong-growing and running varieties 12 to 14 feet each way is required. There are a large number of varieties both for table and fodder, but it is a mistake to grow too many varieties, as they very easily cross-fertilise and become worthless.

SWEET POTATOES.—The tubers should be planted out in seed-beds and covered with sand to encourage them to shoot out, so that cuttings can be obtained for planting out later on. Any early cuttings that can be obtained should be planted out in ridges about three feet apart, and 18 inches apart in the ridge.

TOMATOES.—Numbers of gardeners have tomatoes already established and in flower, and those that have been carried through the winter will soon be bearing early fruit in the warmer districts. Those who are not so fortunate should plant out as many plants as they can, and put in more seed for later planting. There is always a good demand for this popular fruit.

WATER-MELONS.—Prepare the land as described for pumpkins, and plant out about eight seeds in each hill; the hills should be 10 to 12 feet apart each way; and when the plants come up thin out to about five to each hill. Water-melons and preserving melons should not be sown near one another, as they very easily cross-fertilise, and both varieties are spoilt.

FARM.—In the Eastern districts fallowing land for next season's crop will be in full swing; in fact, before these notes appear in print many thousand acres will be fallowed. Settlers in these districts are realising more every year the advantages of fallowing land, the drawback to its being carried out to a greater extent is that the new settler cannot for the first few years get sufficient ground cleared to enable him to fallow any area. It is the older estates who get the benefit of the large area of cleared ground. In the Southern districts, which are favoured with a heavier rainfall, ploughing and preparing the land for summer crops will keep settlers busy. Mangels and sugar-beets, both splendid crops for providing fodder for stock, should be sown without delay. Maize, sorghum, Hungarian millet, French millet, buckwheat, sunflowers, and chicory should all be sown during the month. Pumpkins as a farm crop should prove profitable in this State, but require the ground to be well worked and kept free from weeds. Teosinte, although a slow grower, will give a great supply of succulent green fodder, although it will not ripen its seeds in this climate, although it might do so in the North-West. All grass seeds should now be well above the ground, and require to be kept free from weeds. Roots or seed of the paspalum and other summer fodders should now be sown. In cooler districts lucerne seed may still be sown, but is not likely to do so well as that sown in the autumn. Land should be prepared for sowing, early next month, some of the summer leguminous crops which make such a welcome addition to our supplies of vegetables, and also as food for stock, and at the same time very considerably improve the soil by supplying it with nitrogen from the air.

SHOW FIXTURES.

Gingin Dog and Poultry Society	9th September, 1903
Dongarra Agricultural Society	23rd September, 1903
Geraldton Agricultural Society	29th and 30th September, 1903
Kelmscott and Armadale Agricultural Society ...	7th October, 1903
Beverley Agricultural Society	13th October, 1903
York Agricultural Society	15th and 16th October, 1903
Royal Agricultural Society	20th, 21st, and 22nd October, 1903
Murray Agricultural Society	24th October, 1903
Newcastle Agricultural Society	28th October, 1903
Esperance Agricultural Society	28th October, 1903
Narrogin Agricultural Society	3rd November, 1903
Kojonup Agricultural Society	5th November, 1903
Wellington Agricultural Society	5th and 6th November, 1903
Jarrahdale and Serpentine Agricultural Society	20th February, 1904

The Climate of Western Australia during July, 1903.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						July, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:	Wyndham ...	29·982	30·040	30·134	29·865	87·1	66·3	76·7	93·0	61·0	84·7	64·6	94·8	50·0	*Nil*	4554
	Derby	29·999	30·040	30·149	29·847	85·6	55·1	70·4	92·8	47·0	84·5	57·3	94·0	42·0	*Nil*	2187
	Broome ...	30·016	30·040	30·148	29·874	83·2	57·0	70·1	92·5	49·4	80·8	57·2	91·2	40·2	*Nil*	1608
	Condon ...	30·053	30·093	30·239	29·912	76·8	46·8	61·8	84·8	40·8	76·0	48·3	88·8	38·0	*Nil*	925
	Cossack ...	30·074	30·110	30·254	29·939	76·3	53·8	65·0	83·0	48·3	74·7	54·3	92·0	43·7	*Nil*	966
	Onslow ...	30·100	30·094	30·260	29·980	75·0	52·0	63·5	80·0	46·0	76·1	51·8	88·0	41·0	57	620
	Carnarvon ...	30·125	30·133	30·314	29·920	70·9	50·3	60·6	82·1	45 0	71·8	49·5	81·6	40·5	211	1016
	Hamelin Pool...	30·135	30·145	30·340	29·910	68·0	47·0	57·5	73·0	40·0	69·1	48·0	77·2	36·6	91	522
	Geraldton ...	30·145	30·162	30·400	29·900	67·0	50·0	58·5	71·0	38·0	69·0	49·9	81·0	34·9	528	1498
INLAND:	Hall's Creek *	...	30·120	30·277	29·933	80·6	42·8	61·7	88·6	35·9	77·5	48·4	92·0	35·0	*Nil*	3127
	Marble Bar ...	...	...	...	...	79·2	50·6	64·9	86·0	41·0	...	...	...	...	*Nil*	655
	Nullagine * ...	30·101	30·154	30·307	29·917	74·5	42·7	58·6	81·5	32·2	71·2	44·0	82·0	28·9	*Nil*	662
	Peak Hill ...	30·165	30·212	30·380	29·950	63·0	45·0	54·0	68·0	39·0	64·5	43·4	78·3	34·0	40	488
	Wiluna ...	30·176	...	30·433	29·925	62·1	39·9	51·0	70·6	33·0	...	...	...	...	58	701
	Cue	30·195	30·195	30·430	29·924	63·1	42·2	52·6	73·3	35·8	66·0	44·2	78·2	33·2	69	387
	Yalgoo ...	30·149	30·186	30·439	29·864	62·9	42·7	52·8	72·0	31·0	64·8	42·2	78·0	32·0	84	440
	Lawlers ...	30·180	30·208	30·492	29·800	60·4	39·9	50·2	66·5	31·3	63·4	41·6	78·0	31·6	41	823
	Laverton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Menzies ...	30·175	30·207	30·540	29·790	59·0	40·0	49·5	66·0	34·0	62·2	42·0	77·0	32·0	73	1153
	Kanowna ...	...	...	...	...	58·4	40·3	49·4	65·5	36·4	...	...	...	...	120	845
	Kalgoorlie ...	30·159	30·201	30·539	29·711	58·2	41·7	50·0	65·2	35·9	62·0	42·4	76·2	31·7	116	827
	Coolgardie ...	30·151	30·188	30·557	29·725	57·4	41·3	49·4	66·2	35·8	61·6	41·4	75·3	31·9	130	646
	Southern Cross	30·135	30·178	30·480	29·730	59·0	40·0	49·5	65·0	31·0	62·3	38·4	73·2	25·0	116	508
	Walebing ...	...	...	...	...	56·7	41·4	49·0	66·8	32·4	...	...	...	...	369	1235
	Northam ...	...	...	...	...	60 2	41·3	50·8	66·5	33·0	...	...	...	...	212	754
	York	30·150	30·168	30·510	29·690	60·0	42·0	51·0	65·0	30·0	62·8	40·3	71·2	27·6	170	627
	Guildford ...	...	...	...	...	61·4	44·8	53·1	66·8	34·0	...	...	...	...	431	1478

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during July, 1903—*continued.*

Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
					July, 1903.					*Average for previous Six Years.					
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens ...	30·153	30·147	30·530	29·725	61·7	47·8	54·8	66·0	39·0	63·8	46·0	75·2	33·0	449	1458
Perth Observatory	30·155	30·154	30·540	29·733	61·6	48·1	54·8	67·4	41·2	63·2	47·6	73·8	38·1	496	1455
Fremantle ...	30·148	30·128	30·531	29·731	61·6	51·0	56·3	72·0	43·2	63·0	50·3	71·0	41·2	573	1544
Rottnest ...	30·124	30·116	30·511	29·653	60·8	52·1	56·4	65·6	47·2	62·5	52·9	69·8	40·4	490	1484
Mandurah ...	...	...	...	...	61·7	45·6	53·6	66·5	36·0	...	...	...	...	649	1851
Wandering ...	...	...	...	...	56·0	35·0	45·5	60·0	24·0	...	...	...	...	319	1197
Collie	...	...	...	...	58·3	37·9	48·1	63·8	31·9	...	...	...	...	612	1866
Donnybrook ...	...	...	...	...	60·2	41·5	50·8	65·7	32·1	...	...	...	...	636	1866
Bunbury ...	30·135	30·132	30·560	29·700	61·0	44·0	52·5	68·0	37·0	63·2	46·7	72·2	35·9	922	2472
Busselton ...	...	...	...	...	60·4	43·4	51·9	65·1	34·9	...	...	...	...	486	1578
Bridgetown ...	...	...	...	...	57·5	38·8	78·2	64·0	29·0	...	...	...	...	585	1688
Karridale ...	30·092	30·108	30·542	29·610	59·9	46·7	53·3	64·5	31·0	61·2	46·7	70·8	31·0	719	2226
Cape Leeuwin ...	30·065	29·058	30·540	29·550	60·0	51·0	55·5	65·0	46·0	61·5	52·7	70·6	43·0	520	1524
Katanning ...	30·130	30·137	30·550	29·610	56·0	41·0	78·5	61·0	34·0	58·9	39·8	68·2	25·0	296	1143
Albany	30·085	30·086	30·570	29·580	59·0	44·0	51·5	66·0	36·0	61·4	44·6	73·5	33·5	771	2134
Breaksea... ...	30·070	30·078	30·580	29·590	57·0	49·0	53·0	69·0	42·0	60·0	49·4	71·8	40·0	468	1461
Esperance ...	30·080	30·135	30·550	29·650	61·0	46·0	53·5	68·0	35·0	63·1	44·9	77·6	33·0	415	1188
Balladonia ...	30·133	...	30·547	29·728	59·0	40·3	49·6	68·8	32·0	...	...	...	...	73	539
Eyre*	30·101	30·180	30·562	29·828	60·6	42·6	51·6	72·5	28·6	62·0	41·4	78·1	27·2	185	857
INTER-STATE.															
Perth	30·155	30·154	30·540	29·733	61·6	48·1	54·8	67·4	41·2	63·2	47·6	73·8	38·1	496	1455
Adelaide	30·078	30·168	30·537	29·740	57·7	44·2	51·0	65·0	32·2	58·7	44·3	72·5	32·7	347	...
Melbourne	...	30·025	...	...	...	...	...	...	...	55·5	41·4	63·0	31·6	...	...
Sydney	...	30·116	...	...	...	...	...	...	...	58·9	46·1	74·9	35·9	...	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
8th August, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for July, 1903 (completed as far as possible), and for June, 1903 (principally from Telegraphic Reports).

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham ...	Nil	...	Nil	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	Nil	...
Plympton, St. Mary	...	...	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	Nil	...	Nil	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
West Kimberley:				
Obagama ...	Nil	...	...	...
Beagle Bay ...	...	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	...	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	Nil	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	Nil	...	Nil	...
North-West:				
Wallal	Nil	...	Nil	...
Condon	28	1	Nil	...
DeGrey River ...	49	2	...	...
Port Hedland ...	26	3	Nil	...
Boodarie ...	17	1	...	...
Yule River ...	...	...	...	...
Warralong ...	54	2	...	...
Muccan	...	...	...	...
Ettrick	...	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	...	...	...	...
Pilbarra	181	4	Nil	...
North-West—*cont.*				
Coongon	60	2	...	...
Warrawagine ...	...	...	...	...
Bamboo Creek ...	13	1	11	1
Marble Bar ...	30	3	Nil	...
Warrawoona ...	31	2	...	...
Corunna Downs...	24	3	...	...
Nullagine ...	11	2	Nil	...
Yandicoogina ...	...	...	...	...
Kerdiadary ...	...	...	...	...
Roy Hill	...	...	...	...
Mosquito Creek	...	...	..	...
Mulga Downs ...	...	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	156	4	...	...
Tambrey ...	145	4	...	...
Millstream ...	151	4	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	98	4	Nil	...
Cooyapooya ...	...	...	...	...
Woodbrooke ...	...	...	...	...
Croydon	103	2	...	...
Balla Balla ...	60	3	Nil	...
Roebourne ...	25	2	Nil	...
Cossack	74	3	Nil	...
Fortescue ...	64	4	10	1
Mardie	...	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	...	...	...	...
Onslow	316	4	57	2
Peedamullah ...	319	5	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	...	...	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	180	6	...	...
Point Cloates ...	...	...	...	...
Gascoyne:				
Winning Pool ...	529	6	107	2
Towara	...	...	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	230	3	...	...

RAINFALL—*continued.*

STATIONS.	JUNE.		JULY.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	...	...	...	...
Yanyeareddy ...	...	...	...	...
Williambury ...	...	...	...	...
Wandagee ...	...	...	...	...
Bernier Island ...	432	9	...	...
Boolathana ...	491	9	...	...
Carnarvon ...	501	10	211	5
Cooralya... ...	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	...	...	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	...	...	...	...
Upper Clifton Downs	...	...	...	...
Errivilla... ...	323	4	...	...
Dirk Hartog Island	518	11	...	...
Sharks Bay ...	638	...	123	5
Kararang ...	507	9	...	...
Meedo	...	...	...	...
Tamala	...	...	...	...
Wooramel ...	430	9	92	6
Hamelin Pool ...	340	8	91	7
Byro	176	5	...	...
Yarra Yarra ...	236	4	...	...
Berringarra ...	236	4	...	...
Mt. Gould ...	111	4	...	...
Moorarie ...	244	4	...	...
Wandary... ...	213	4	...	...
Peak Hill ...	193	3	40	3
Horseshoe ...	220	3	...	...
Mount Fraser ...	275	3	...	...
Abbotts	291	5	56	2
Belele	215	5	...	...
Mileura	191	5	51	2
Milly Milly ...	155	4	...	...
Manfred ...	140	6	...	...
New Forest ...	320	9	...	...
Woogorong ...	208	7	...	...
Twin Peaks ...	222	7	...	...
Billabalong ...	257	5	...	...
Wooleane ...	290	6	...	...
Murgoo	263	5	118	3
Meeka	204	7	98	5
Mt. Wittenoom ...	214	7	108	7
Nannine	172	3	106	5
Star of the East...	184	3	109	5
Tuckanarra ...	172	8	71	5
GASCOYNE—*contd.*				
Coodardy ...	94	6	79	3
Cue	123	7	69	3
Day Dawn ...	84	5	52	3
Lake Austin ...	197	6	68	4
Lennonville ...	203	8	61	6
Mt. Magnet ...	212	6	71	5
Warracoothara ...	282	5	...	...
Challa	199	8	62	5
Youeragabbie ...	236	6	...	...
Murrum	346	6	...	...
Burnerbinmah ...	207	8	...	...
Barnong	389	10	...	...
Yalgoo	265	9	84	...
Gabyon	283	7	...	...
Wuralga ...	281	6	...	...
Gullewa	359	8	164	5
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	489	11	...	...
Mumby	549	13	459	13
Northampton ...	520	11	482	13
Mt. Erin ...	522	12	371	10
Oakabella ...	757	14	533	13
Tibradden ...	529	14	...	...
Sand Springs ...	391	11	...	...
Mullewa... ...	399	13	322	10
Kockatea ...	421	12	...	...
Bootenal ...	574	7	...	...
Geraldton ...	859	16	528	15
Greenough ...	1010	9	432	11
Dongara ...	792	12	338	13
Dongara (Pearse)	770	13	...	...
Strawberry ...	479	9	324	8
Nangetty ...	146	5	267	9
Mingenew ...	529	14	293	12
Urella	346	12	...	...
Yandenooka ...	466	10	311	13
Rothesay ...	356	5	...	...
Field's Find ...	133	4	...	...
Carnamah ...	526	12	255	11
Watheroo ...	497	13	268	13
Dandaragan ...	453	14	446	16
Moora	399	13	421	11
Yatheroo ...	385	13	419	13
Walebing ...	450	17	369	12
New Norcia ...	369	14	287	12

RAINFALL—*continued.*

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-Western Division, Central (Coastal) :				
Gingin	688	15	619	17
Belvoir	503	15	492	12
Mundaring ...	615	17	603	15
Guildford ...	637	19	431	17
Kalbyamba ...	596	15	630	12
Canning W't'r'w'ks	700	14	623	14
Perth Gardens ...	596	18	449	18
Perth Observatory	623	19	496	18
Subiaco	629	17	525	17
Claremont ...	...	...	...	...
Claremont (Richardson)	560	14	...	...
Fremantle ...	443	18	573	19
Rottnest	501	16	490	19
Armadale ...	699	13	...	...
Rockingham ...	539	14	682	16
Canning River ...	752	11	...	...
Jarrahdale ...	703	15	783	15
Mandurah ...	738	16	649	15
Pinjarra	902	17	867	18
Yarloop	802	18	670	20
Harvey	829	18	704	18
South-West, Central Part (Inland) :				
Hatherley ...	317	12	...	...
Momberkine ...	293	11	215	9
Monglin ...	309	13	...	...
Newcastle ...	463	12	285	13
Eumalga ...	501	16	340	14
Northam ...	296	14	212	11
Grass Valley ...	298	14	197	13
Meckering ...	288	14	126	9
Cunderdin ...	...	...	173	10
Codg-Codgen ...	151	15	...	...
Jarragin... ...	178	12	...	...
Doongin	178	10	126	9
Cuttenning ...	201	13	136	14
Whitehaven ...	255	13	...	...
Sunset Hills ...	288	12	...	...
Cobham	368	16	226	16
York	276	15	170	15
Beverley ...	208	15	170	12
Barrington ...	229	15	191	13
Stock Hill ...	294	12	262	12
Sunning Hill ...	279	13	214	12
South-West—*contd.*				
Wandering ...	460	15	319	15
Glen Ern ...	417	18	230	19
Pingelly ...	362	11	203	10
Woogenellup ...	371	14	...	...
Marradong ...	571	15	409	12
Bannister ...	556	17	...	...
Narrogin ...	397	14	257	15
Wickepin ...	364	15	...	...
Gillimaning ...	370	13	...	...
Bunking ...	722	11	233	7
Bullock Hills ...	618	10	...	...
South-West Division (Southern Part) :				
Bunbury ...	967	18	922	17
Collie	785	19	612	20
Glen Mervyn ...	835	19	599	15
Dardanup ...	817	15	...	...
Donnybrook ...	801	21	636	15
Boyanup ...	771	15	755	14
Ferndale ...	702	23	644	21
Busselton ...	581	20	486	20
Lower Blackwood	805	24	...	...
Karridale ...	601	25	719	24
Cape Leeuwin ...	472	25	520	25
Biddellia ...	460	21	859	23
The Warren ...	493	21	898	23
Lake Muir ...	343	19	454	23
The Peninsula ...	...	...	622	25
Mordalup ...	309	19	623	17
Deeside	302	21	409	24
Riverside ...	305	21	444	25
Balbarup ...	380	16	637	17
Wilgarup ...	436	22	...	...
Mandalup ...	822	20	623	17
Bridgetown ...	516	25	585	26
Westbourne ...	573	19	446	22
Hilton	467	12	438	15
Greenbushes ...	734	11	568	13
Greenfields ...	583	16	...	...
Glenorchy ...	603	19	...	...
Williams ...	440	14	321	17
Arthur	577	13	276	10
Darkan	562	12	...	...
Wagin	571	13	278	15
Glencoe ...	513	15	334	14
Dyliabing ...	561	16	295	19
Katanning ...	404	14	296	...

RAINFALL—*continued.*

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*				
Kojonup ...	746	16	466	23
Broomehill ...	365	9	532	16
Sunnyside ...	468	13	313	16
Woodyarrup ...	548	14	...	...
Cranbrook ...	350	17	362	18
Blackwattle ...	409	20	...	...
Mt. Barker ...	362	18	497	22
Kendenup ...	395	20	485	23
St. Werburgh's...	304	18	...	...
Forest Hill ...	360	23	667	25
Denmark ...	576	17	773	25
Grasmere ...	424	12	672	25
Albany	431	25	771	24
Point King ...	457	18	756	23
Breaksea ...	309	24	468	24
Pallinup ...	483	12	255	16
Bremer Bay ...	489	13	410	17
Jarramongup ...	...	...	...	...
EASTERN DIVISION:				
Lake Way ...	191	4	58	6
Gum Creek ...	172	3	...	...
Mt. Sir Samuel ...	184	4	59	4
Lawlers	212	7	41	5
Leinster G.M. ...	166	4	...	...
Lake Darlôt ...	142	3	...	...
Mt. Leonora ...	223	3	44	5
Mt. Malcolm ...	209	3	17	2
Mt. Morgans ...	170	4	36	5
Burtville ...	119	2	...	...
Laverton ...	152	3	37	4
Murrin Murrin...	229	4	46	4
The Granites ...	190	4	34	3
Tampa	199	2	...	...
Kookynie ...	201	4	69	3
Niagara	169	5	92	3
Yerilla	211	3	50	4
Edjudina ...	240	3	...	...
Menzies	151	7	73	4
Mulline	231	6	90	...
Waverley ...	184	6	95	4
Goongarrie ...	132	7	65	3
Mulwarrie ...	194	4	112	5
Kurawa	180	7	102	8
Kurnalpi ...	122	5	87	6

Stations.	June.		July.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EASTERN—*contd.*				
Bulong	134	8	67	10
Kanowna ...	158	6	120	...
Kalgoorlie ...	218	7	116	8
Coolgardie ...	158	8	130	8
Burbanks P.O. ...	138	7	131	9
Woolubar ...	175	7	102	11
Widgiemooltha...	121	8	130	9
50-Mile Tank ...	78	5	125	9
Waterdale ...	116	6	119	9
Norseman ...	40	4	105	10
Lake View ...	49	11	...	...
Bulla Bulling ...	116	5	139	6
Woolgangie ...	129	6	149	5
Boorabbin ...	215	10	128	11
Karalee	200	8	...	...
Yellowdine ...	121	4	109	4
Southern Cross...	113	8	116	8
Mt. Jackson ...	235	5	...	...
Bodallin ...	109	6	...	...
Burracoppin ...	148	10	151	5
Kellerberrin ...	182	11	105	12
Mangowine ...	159	10	...	...
Wattoning ...	148	6	...	...
EUCLA DIVISION:				
Ravensthorpe ...	87	10	202	16
Coconarup ...	123	11	...	...
Hopetoun ...	84	10	398	18
Fanny's Cove ...	119	4	...	...
Park Farm ...	188	18	...	...
Esperance ...	285	20	450	22
Gibson's Soak ...	173	16	...	...
30-Mile Condenser	168	13	...	...
Swan Lagoon ...	70	14	...	...
Grass Patch ...	77	14	...	...
Myrup	196	19	...	...
Lynburn ...	124	10	...	...
Boyatup... ...	214	14	...	...
Point Malcolm ...	161	16	...	...
Israelite Bay ...	75	9	179	15
Frazer Range ...	...	...	...	...
Balladonia ...	92	...	73	...
Southern Hills ...	...	...	...	...
Eyre	126	14	185	13
Eucla	74	16	92	15

The Observatory, Perth,
8th July, 1903.

W. E. COOKE,
Government Astronomer.

By Authority: WM. ALFRED WATSON, Government Printer, Perth.

JOURNAL

OF THE

Department of Agriculture

OF

WESTERN AUSTRALIA.

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NOTES.

INSECT PESTS.—This is a good month in which to keep a watchful eye on all fruit trees. On the first sign of any of the insect pests making their appearance, spraying should be resorted to at once.

HANDBOOK OF HORTICULTURE AND VITICULTURE.—It is very pleasing to see the way in which this publication has been received, applications from all parts for copies being daily received.

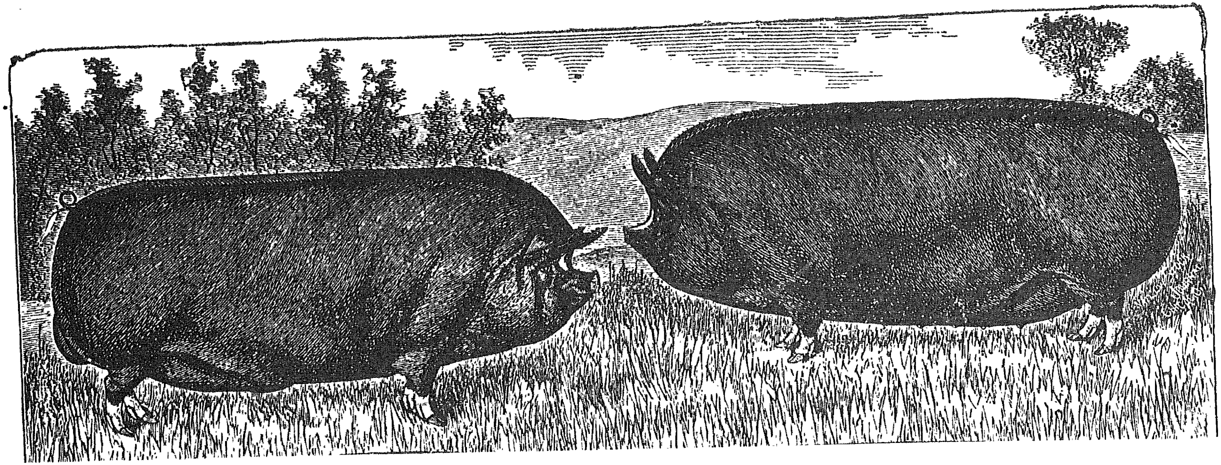
MAIZE-GROWING.—It is a pity that more of our farmers do not go in for maize cultivation. As a feed for stock, pigs, poultry, etc., crushed and whole, it forms a real valuable food. Now is the time to put in a trial crop. Those whose wheat crop has proved a failure should sow largely of some good kind, say *Hickory King or* Gold Cap.

ORCHARD MANURING.—If not already attended to, orchards should be cleared of all winter growth. If a green crop has been sown this should be ploughed in as early as possible. Some quick acting manures should be worked in, such as sulphate of ammonia, sulphate of potash, or superphosphate. Do not put too much on at once, as there is always a danger, owing to its solubility, that a great portion will be washed out of the ground before the plant or tree has time to utilise it.

THE INDIAN WHEAT CROP.—"Beerbohm's List," from Calcutta, gives the final official estimate of the Indian wheat crop as 36,300,000qrs. of 480lb.—the greatest crop on record. This is mainly owing to a tremendous crop in the United Provinces of Agra and Oudh, where the area was 6,926,000 acres, and the yield the unprecedented one of 16 bushels per acre. Rain fell in time to improve the crop greatly in the late stage of its growth, the second report for these provinces having put the expected return at only 90 per cent. of an average.

POTATOES IN GERMANY.—As "a wealth producer," says Mr. Mason, the potato plays a leading part in Germany, its cultivation and uses having been developed by consummate scientific methods, until it and its by-products now hold an important place in the field of applied mechanics. One-eighth of all the arable land in the empire is planted in potatoes. In 1900 there were 160 acres of the tubers for every 10,000 inhabitants, as against 112 acres in Austria, 98 in France, 34·8 in the United States, and 31 in Great Britain and Ireland. The yield increased from 32,329,000 metric tons in 1896 to 48,687,000 in 1901. Half of the immense crop is consumed directly as human food. Then, too, "recent improvements" in dessicating "shredded and sliced potatoes" have led to their extensive use by the German army and navy as well as by the colonists in Africa and Asia. Agricultural experiment stations in this country might do well to note the character of these "improvements." The tuber also holds an important position in German farming and meat production. But little maize is produced in the empire, and the potato largely fills the place of corn and other cereals. It is fed, both raw and steamed, to cattle, hogs, sheep, and poultry.

AGRICULTURAL STUDENTS.—There are now vacancies for about eight pupils on the experimental farms of this State, one of which is situated at Narrogin, on the Great Southern line, and the other at the Chapman Agricultural Area, in the Northampton district. The pupils will receive a thoroughly practical course of training, being taught all kinds of farm work, and will also have to attend lectures on the elementary principles of agriculture and veterinary surgery. Stock of all kinds are kept on the farms, and a good practical knowledge of the working and care of stock can be obtained. In order to put the advantages of an agricultural education within the reach of all, the terms have been made extremely easy, the fee being only £2 2s. per annum. Students are not taken in under the age of 16, and a complete course will extend over two years. All further imformation can be obtained from the Director of Agriculture, Perth. Students can join any time. Regulations, etc., are published elsewhere in this issue.



Berkshire Pigs.
Heads too small, short, and pointed.

LOANS TO FARMERS.—It is notified by advertisement elsewhere in this issue that farmers in remote districts who desire advances and who are unable to personally call on the Manager of the Agricultural Bank, may apply by letter, briefly stating the amount required, and enclosing £1 for every £100 applied for.

AMMONIA FROM THE AIR.—According to Mr. John Speir, some ingenious person has on the point of completion a scheme for the requisition of ammonia from the air for agricultural purposes. The idea is being worked out on a comparatively small scale at present, and it is anticipated that the process will be proclaimed publicly in the course of a month or two. It is calculated that this discovery will prove of immense value in cheapening the costliest of soil fertilising substances, and important results are looked for in consequence.

DUBBING FOWLS.—Obtain a sharp pair of scissors (slightly curved scissors are best), and get an assistant to hold the bird, the latter holding the bird firmly against his body with one hand and the comb in the other. The operator should now take hold of the loose skin of the ear-lobe, insert the point of his scissors, and dissect the outer portion, leaving no loose skin behind. Having done this on both sides, the wattles should next receive attention. Take each one singly, and cut close to the face-skin; do not, however, cut into the latter, nor the skin-throat; and, lastly, take the comb off. This is best performed by commencing at the back and cutting towards the beak. Press the scissors firmly down on the head, following the curve of the head, and removing the comb as close as possible to the head. If this is done correctly, but little else will be necessary, except perhaps to give a couple of snips each side of the front, to remove any slight excrescence that may still remain. It is a good plan to hold the bird's head under a tap of cold water for a few seconds, and, with a dry soft cloth, wipe it a little, and in the evening apply a little vaseline. This latter will enable the scabs that form to fall off much sooner than would have been the case if nothing had been applied to it.

JUDGING.—In this issue will be found complete guides and copies of forms to be used for the judging of pigs, sheep, horses, and cattle. We would recommend all exhibitors to obtain a certificate of points from the judge, so that they will be able to see why they were given a prize or why they failed in securing the coveted honour.

THE BERKSHIRE PIG.

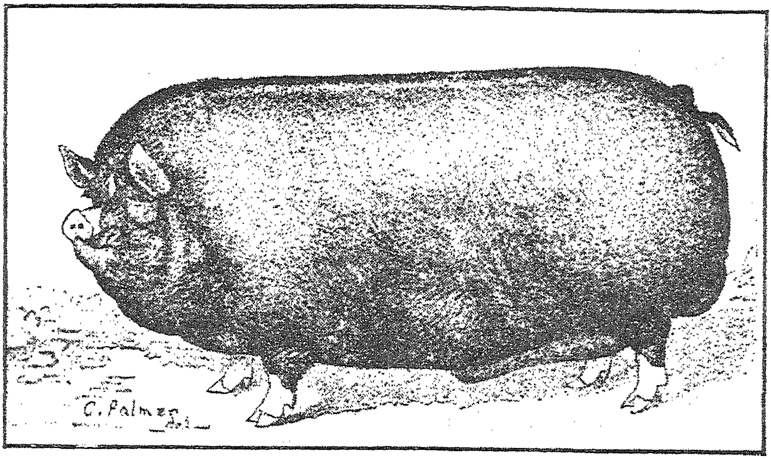
By Alex. Crawford.

For some years past there has been a considerable difference of opinion amongst the breeders of Berkshire pigs in this State as to what is the correct type of head in this most popular breed of all our pigs. Some of our breeders went in for the small head and sharp-pointed upturned nose, while others went in for the larger head and straight or slightly downcast nose.

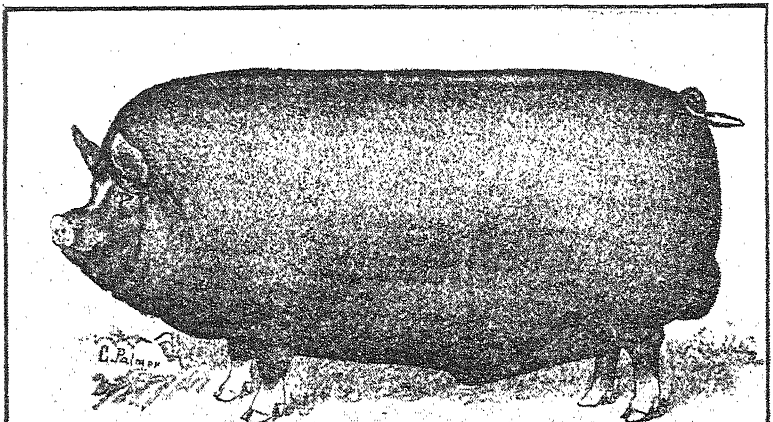
To try and get the matter settled by the best authority, I wrote to the Secretary of the Berkshire Pig Society of England, asking him if he could let me have photographs of the pigs that they considered approached nearest to perfection, and for his opinion as to the proper type of head. I am greatly indebted to the kindness of Mr. Heber Humfrey, the Secretary, who sent me out various illustrations of the breed, and who writes as follows on the subject:—"I think I can give you a fair idea of what our judges like, though we have not succeeded in getting the pigs so uniform as we would like to see them as regards their heads. The best and most natural illustration I can send you is one of 'Her Majesty,' B.B. No. 3293, shown some years ago by one of our oldest breeders, Mr. Benjafield. One of the most important points I consider to be, that the head should compare well, as to size, with the body. I will cut one or two illustrations from an American book that will show exactly what I mean (*see* illustration 'A Smart Pig'). I should not like to encourage a breeder who goes to the extreme after nice fine heads. For one reason a pig looks mean when, by his appearance, he gives the idea of having a porker's head fixed on the full-grown pig's body, and another reason is that in three or four generations the body is about certain to dwindle down to match the head. I believe in a pig's head rather than a pug's head for a pig. I do not see any object in the turned-up nose; most of them have to find their own living at some time of their lives, and the very short pugged head is not then satisfactory. You will see that I am purposely giving you the sow's head longer than the boar's, and I have always found in breeding that this is sound policy, as it is right to have the male animal compact and well-ribbed up, while the sow should be chosen for length as well as for proper form. I have always taught myself to believe that they follow their heads in this matter of length sooner or later. I have not mentioned the very long straight noses found as deteriorated specimens amongst the common bred Berkshires. These are well on their way back to the quality of the 'Wild Boar of the Woods'; they are usually hard feeders and do not weigh well enough to make compensation."

Mr. Humfrey's remarks as above are well worthy of the attention of all Berkshire breeders, and a careful study of them ought to have the effect of making our show of Berkshires in the future much more uniform than they have been in the past. There

BERKSHIRE PIGS.


C. Palmer del.

A smart pig.



A trifle narrow between the ears, which, it will be noticed, gives rather a sour appearance.

is one point in pig-breeding that I would like to bring out, that is, that the best and most perfect specimens are very often bred, not from championship winners or even prize sows at all, but from sows that are, if anything, on the coarse side, but mated to a really good specimen of the breed. So far as my experience has gone I have found that when I mated two pigs as nearly perfect as I could get them the offspring were, as a rule, not too satisfactory, as they were mostly on the fine side. My best results have been to mate a large roomy sow rather on the coarse side with a first-class boar just about right as regards fineness of bone, and the offspring from such have been most satisfactory, for there is always a tendency among highly bred pigs to become too fine. In the illustration "Her Majesty" may be taken as the correct type to breed for as a sow, and "A Smart Pig" in the boar. "Robin Hood" shows a good class of pig but too narrow between the ears, which gives him a rather sour appearance; while the other illustration shows a good bodied pig, but with head much too small and pointed. The illustration "A Smart Pig" is a likeness of D'Israeli 813.

THE INOCULATION OF SOILS FOR LUCERNE.

By Percy G. Wicken.

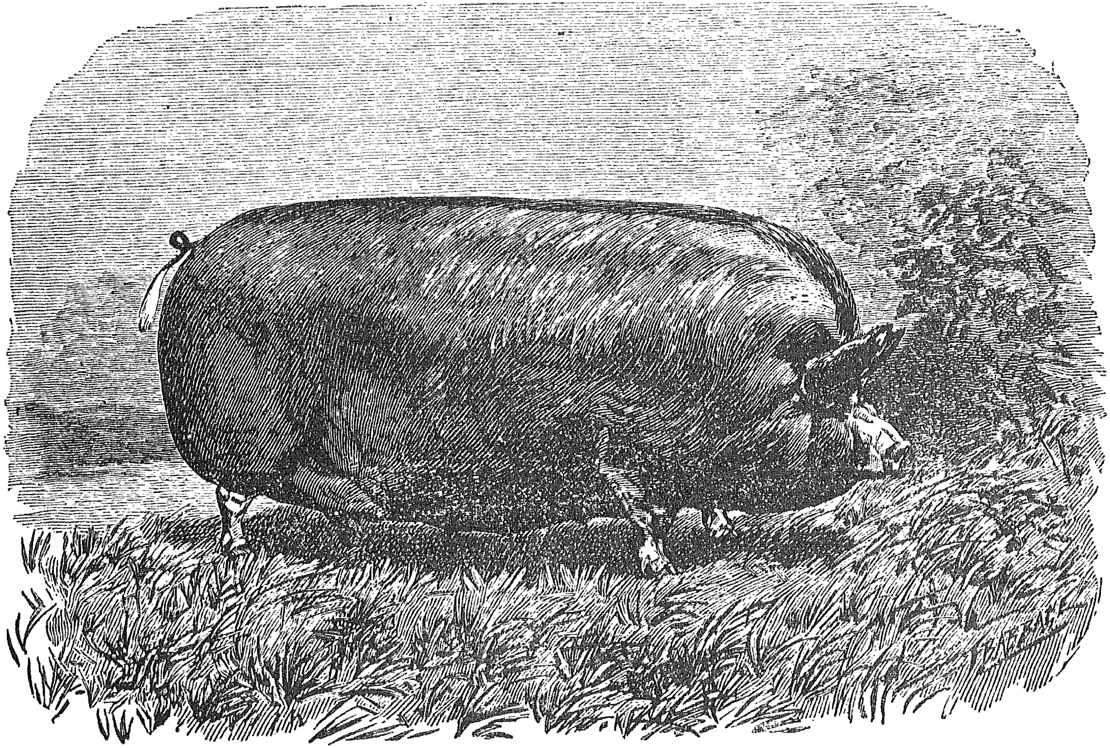
Repeated complaints are made by settlers of the failure of lucerne or alfalfa to grow successfully in this State. In the majority of cases the cause is not hard to find, and is generally insufficient working of the soil. Lucerne requires a thoroughly well and deeply worked soil, the surface of which should be cultivated to a fine tilth, and the soil must be clean and free from weeds. Lucerne when young is a delicate plant, and requires the full use of ground until the roots become well established. It is a crop that, when once established, continues to yield crops for several years without any further expenditure. It is therefore worth the extra trouble and expense to give the soil a thorough pulverising before sowing the soil, and the extra labour involved in keeping the weeds in check during the early period of growth. When once it becomes established, and the roots penetrate deeply into the ground, it will hold its own against any weeds that may come up. Where the ground has been properly worked, and other conditions are favourable, and the crop still proves unsatisfactory, the cause must be looked for elsewhere, and if we carry our investigations further we shall probably find that it is due to the absence of certain bacteria in the soil, which are necessary for the successful growth of this plant. The bacteria cause little nodules to form on the roots of the plant, and by this means they are enabled to take in their supplies of nitrogen from the atmosphere.

Recent experiments carried out at different experimental stations in U.S.A., particularly at the Illinois Experimental Station, demonstrate this fact beyond doubt, and the results of their investigations have caused a great improvement of the lucerne crop in their district. The method by which this bacteria is supplied to the crop is to obtain a supply of soil from a field in a district in which lucerne is successfully growing, and apply this to the crop in the same way as we apply manure, and at the rate of about 100lbs. per acre. This quantity is sufficient to provide a very fair amount of inoculation; and as there are countless numbers of the bacteria in this quality of soil, they rapidly spread in their new quarters and inoculate the whole area. This infected soil should be spread as evenly as possible over the whole field, and can either be applied at the time of sowing the seed, or in the case of a crop already up can be spread over the surface as a top dressing, and harrowed or disked in. If the area over which the crop is growing is undulating, the infected soil should be spread over the higher part of the land, as the natural forces of wind and water will soon carry it from there to the lower levels, and the whole field will soon become even.

Should the above conditions prove to be suitable for this State' and from late experiences I have no doubt they will be so, we can account for a number of the failures to grow lucerne. We have no good lucerne fields in this State, and therefore the inoculated soil will have to be obtained from some of the old established lucerne-growing districts of the Eastern States.

The soil requires to be dug from a lucerne field in which the roots of the plants are well covered with the little characteristic nodules, and plenty of the roots should be dug up and bagged up with the soil. The soil should be taken from the field when it is in a good warm moist condition, and bagged at once. It should not be taken when very wet or very dry, and should be sent to its destination and spread out on the ground as quickly as possible.

Mr. A. W. Edgar, of Strathalbyn, Gingin, a gentleman who is much interested in experimental work, some time ago obtained from Victoria a bag of roots and infected soil for the purpose of trying the effects on some lucerne he was sowing, and at the time of my last visit a very perceptible difference was noticeable in the lucerne round about where the infected soil was thrown out. If some of our more progressive settlers who are interested in the growing of lucerne would obtain a few bags of infected soil and experiment for themselves on a small area of their crops, the Department of Agriculture will be very pleased to hear the results of their efforts, and to publish the same in the JOURNAL, as it may do much to solve the problem of lucerne-growing in this State. Lucerne is a crop that, if we could grow successfully, would largely increase the stock-carrying capacity of our farms, and also add a valuable item, in the form of a leguminous food, to the daily rations of our farm stock. In fact, every farm should have its lucerne paddock, without which it is not complete.



Berkshire Sow—Her Majesty, B.B., No. 3293.

JUDGING LIVE STOCK BY POINTS.

Some inquiries having come into this Department asking for forms for judging live stock by points and how it is done, the following information may be of interest to the committees of agricultural shows:—

In the descriptive sheets the value of the various parts of the animal are given, which shows by comparison the value of one part as against another. These sheets should be printed on cardboard and given to the judge when going to the show-ring, and should be returned to the secretary when the judging is over, for future use.

The skeleton sheet is also given to the judge, and he fills in the number of points given to each animal, the number of whose pen is at the top of each column. After all the animals have been inspected, and points allotted to them, the total of each is added up at the foot of the column, and the one securing the highest number is awarded first prize, the next highest second, and so on; all the animals can be placed in order of merit.

In many shows in America and England point-judging is insisted on, and there is no doubt but that it leads to much greater uniformity in results than in the other system.

BOAR PIG.

	Maximum No. of Points.	NUMBER OF EXHIBITS.															
1. Pedigree	8																
2. Offspring	8																
3. Style and character ...	4																
4. Size	5																
5. Colour	2																
6. Hair	2																
7. Skin	2																
8. Ear	2																
9. Head	4																
10. Eye and expression ...	3																
11. Jowl	2																
12. Neck	4																
13. Shoulder	4																
14. Breast and brisket ...	3																
15. Chest and fore rib ...	7																
16. Back and loin and belly	12																
17. Back ribs and flank ...	6																
18. Hams and rump ...	13																
19. Tail	1																
20. Legs	6																
21. Feet	2																
Total																	

PIGS.—POINTS OF A BACON BOAR PIG.

Description of the Points and their Values.

	Single Points.
I.—PEDIGREE, ETC.	
1. "Pedigree."—Purity of breeding as shown by certificates and owners' declarations	8
2. "Offspring."—Success of offspring at shows, to be proved as above	8
II.—STYLE, ETC.	
3. "Style and Character."—Display, purity of breeding, and general excellence	4
III.—SIZE.	
4. "Size."—A good length from head to tail, and the live weight at 18 months should be from 300lbs. to 400lbs.	5
IV.—QUALITY.	
5. "Colour."—According to breed	2
6. "Hair."—Abundance of, smooth and evenly set in	2
7. "Skin."—Of medium thickness, soft and elastic to the touch	2
8. "Ear."—Rather small, thin, and tolerably erect, not objectionable if it droops slightly forward	2
9. "Head. etc."—Head short and broad between the eyes, nose short, cheeks full	4
10. "Eye and Expression."—Not too small, open and mild, disposition quiet and contented	3
V.—FORE-QUARTER.	
11. "Jowl."—Heavy	2
12. "Neck."—Thick and short and running evenly into the shoulder and back	4
13. "Shoulder."—Not large, yet sufficiently so to be symmetrical	4
14. "Breast and Brisket."—Broad, and well let down to the knee	3
15. "Chest and Fore-ribs."—Deep and rather barrel-shaped ...	7
VI.—MIDDLE.	
16. "Back and Loin."—Broad and slightly curved or arched from shoulder to setting on of tail	12
17. "Back Ribs, Flank, and Belly."—Back ribs well sprung and deep. Underlines straight from the brisket to and including flank	6
VII.—HIND-QUARTER.	
18. "Hams and Rump."—Long from the back to the setting on of the tail, and broad and full	13
19. "Tail."—Long, and tuft of long hair at tip	1
VIII.—LEGS, ETC.	
20. "Legs."—Perfectly straight, bone fine, meat down to knee and hock	6
21. "Feet."—Short and small, set well under the body, yet wide apart	2
Aggregate	100

MERINO SHEEP.

Points of a Medium Combing Merino Ram and Ewe.

Description of Points and their Values of Medium Combing Ram.

	Single Points Aggregate.
I.—BREEDING AND QUALITY.	
I.—PEDIGREE AND OFFSPRING.	
1. "Pedigree."—According to standing in Stud Book, or as proved by certificates and declarations	20
2. "Offspring."—To be viewed from the character of the offspring, as shown by their success at shows	20
II.—GENERAL APPEARANCE, STYLE AND CHARACTER.	
3. "Symmetrical Form and proper Complexion and Covering"	10
III.—HEAD.	
4. "Countenance."—The forehead should be broad and the countenance healthful	5
5. "The Eyes."—Should be bright and placid, and free from spots	3
6. "The Muzzle," etc.—The muzzle should be clean, the nostril expanded, and the nose white, wrinkly, and covered with short, furry, soft, velvety hair	5
7. "The Ears."—Should be white, soft, thick, wide apart and partly covered with wool	3
8. "The Horns."—Should not be too close to the head and neck, nor standing out too widely, and free from black or dark streaks	4
II.—FORM AND CONSTITUTION.	
IV.—FORE-QUARTER.	
9. "The Neck."—Should be short on the top, deep when viewed from the side, and long below, strongly set to the head and shoulders, towards which it should be becoming deeper ...	5
10. "The Shoulders."—Should be broad and massive as to depth and breadth, very little, if any, above the level of the back, and well placed	4
11. "The Chest."—Should be wide and deep...	4
12. "The Skin."—Should be thick, soft, and pink	2
V.—MIDDLE.	
13. "The Barrel."—Should be round and lengthy	6
14. "The Back."—Should be short, level, strong, and straight ...	5
15. "The Loin."—Should be broad and strong	4
VI.—HIND-QUARTER.	
16. "The Flank."—Should be deep and straight	4
17. "The Quarters."—Should be long and well filled up	4
18. "The Thighs."—Should be long and broad	2

MERINO SHEEP—*continued.*

	Single Points. Aggregate.
VII.—LEGS, FEET, ETC.	
19. "The Legs."—The fore-legs should be short, straight, and well apart, and the hind legs should be set so as to give the hind parts a perpendicular appearance; while the bone should be heavy but of fine texture	5
20. "The Muscle."—Should be fine and firm	2
21. "The Hoofs."—Should be clear in colour and well-shaped ...	3
VIII.—SIZE.	
22. According to the class of sheep	5
III.—THE WOOL.	
IX.—QUANTITY.	
23. "Length of the Staple."—According to division—"strong," "medium," or "fine." Strong combining from 1-900th to 1-1100th of an inch; medium from 1-1100th to 1-1300th of an inch; fine, finer than 1-1300th of an inch	5
24. "Density."—Closeness and thickness all over but especially on the top of the shoulder and back	30
25. "Evenness."—In length and density of fleece over the whole body, legs, belly, back, and head	20
X.—QUALITY.	
26. "Brightness, including Lustre."—Denotes facility for taking delicate dyes	5
27. "Softness."—Soft and silky to the touch, but elastic	8
28. "Crimp."—The regularity of the waves and the trueness of the fibre	7
29. "Freedom from Gare," *i.e.*, "Kemp"	5
30. "Fineness."—According to division	17
31. "Freeness."—Denoting few noils in combing and including building up of staple	6
32. "Evenness".—In the quality of the fleece over the whole body, legs, belly, back, and head	17
XI.—CONDITION.	
33. "Quality of Yolk."	3
34. "Fluidity of Yolk."	2
Aggregate numbers	250

ABSTRACT.

	Single Points.
Breeding and quality	70
Form and constitution	54
Wool	126
Total marks	250

The points and values for Ewes are the same as for Rams with the following exceptions:—The marks for "muzzle" are, for Ewes, four instead of five,; those for "horns" are omitted, and five marks are added for "evenness of covering."

POINTS OF HORSES.—HEAVY DRAUGHT HORSES.

Description of the Points and their Values.

	Single Points Aggregate.
I.—PEDIGREE AND OFFSPRING.	
1. "Pedigree."—To be viewed in the light of the standing of the horse in the stud book, or as proved by certificates and declarations	20
2. "Offspring."—According to records of prizes gained by progeny	20
II.—GENERAL CHARACTER, STYLE AND ACTION.	
3. "General Character."—That beauty of outline and form (in rest) in an animal which is seen at a glance, and which, when combined with the next point, indicates purity of blood and high breeding	10
4. "Style and Carriage."—The natural and unrestrained carriage of the head, neck and tail, and the movement of the limbs as presented in a state of animation, which, with the preceding point, indicate purity of blood	5
5. "Action."—This will embrace the action and use (the bending of the knee and hock) of the limbs at the walk and slow trot, in which the difference between a dragging motion and quick, tappy lifting of the feet will be considered. In the trot the action should be free and quick, and in the walk the step should be long, the sole of the foot being almost inverted each time it is lifted	10
III.—COLOUR AND SIZE.	
6. "Colour."—According to public taste, the leading colours may be classed according to their estimation as follows:—Bay, dark chestnut, brown, black, roan, grey; white markings beyond a star are more or less objectionable, according to extent	5
7. "Size."—Height, stallions, 16½ hands; mares, 16 hands ...	10
IV.—HEAD.	
8. "Ear."—Should be active, thin and generous in length, neither hanging down nor prick-eared. The action of the ear with the eye discloses character	3
9. "Face."—The head as a whole should be in proportion to the size of the horse. It should be broad between the eyes, with prominent brain development, clean and bony, not loaded with flesh	8
10. "Eye and Expression."—This organ and the ear show character; and not only the fulness of the eye, but its character must be studied. It should be dark, bright, mild, lively and truthful, but indicative of plenty of muscular energy	9

POINTS OF HEAVY DRAUGHT HORSES—*continued.*

	Single Points Aggregate.
IV.—HEAD—*continued.*	
11. "The Jaws."—The jaws should be wide apart to give ample room for the wind-pipe	2
12. "The Lips."—Should be neat and compressed, and not open or hanging down	1
13. "The Nose and Nostril."—The nose should be straight or very slightly arched (not dished), and the nostril should be wide, high, and active	2
V.—FORE-QUARTER.	
14. "The Neck."—This point will include the setting on of the head, the length and shape of the neck, the free development of the windpipe, especially at the throttle, and the junction of the neck with the shoulders and breast. It should be somewhat thick, long, and slightly arching in the horse, and very slightly in the mare, when she is in good condition	10
15. "The Breast."—Should be sufficiently full and deep to give ample room for the heart and lungs	5
16. "The Withers."—Should be rather high to give free action, and should be muscular and sloping (but not so much so as in the hackney) evenly into the shoulder	4
17. "The Shoulders."—Should be strong and muscular, fairly well laid back, and should rise with a clean and even slope towards the withers	6
18. "The Fore Ribs."—Should be round (hooped), deep, and full. There must be ample room for the heart to beat and lungs to play. Deficient in this, the sire's stock will lack vigour of constitution and pluck	5
19. "Chest."—Should be deep and well developed, and should run evenly into the shoulder, not chest-tied	5
VI.—THE MIDDLE.	
20. "The Back."—Should be comparatively straight and broad, and not so long as to entail weakness, and it should run full and wide into the loin	6
21. "Back Ribs."—Should spring roundly in an arch from the back-bone, and run well back towards the hind quarters, *i.e.*, well-ribbed home, and the last ribs should be round and well let down	6
22. "The Belly."—Should be fairly let down, but not be pot-bellied, nor too much tucked up, and with sufficient room for food	3
23. "The Loin."—Should be full, long, level, and broad, extending along the back to give strength to the horse...	6
24. "The Flank."—Should be clean, neat, and fairly developed...	2
25. "The Sheath."—Should be well developed	2
VII.—THE HIND-QUARTERS.	
26. "The Hips."—The hip-bones should be well apart, not protruding, but symmetrical	3
27. "The Quarter."—Should be broad and strong, the stifles well apart and wide when viewed from behind, with well-turned buttocks	7

POINTS OF HEAVY DRAUGHT HORSES—*continued.*

	Single Points. Aggregate.
VII.—THE HIND QUARTERS—*continued.*	
28. "The Croup."—Should be long and comparatively level, but with a proper elevation gracefully sloping towards the tail	5
29. "Tail and Set-on."—The tail should leave the croup, and be carried handsomely at the proper height, with free, soft, but strong hair	5
VII.—LEGS, &c.	
30. "Fore Arm."—Should be broad, muscular, and well-developed	10
31. "The Knee."—Should be comparatively large, strong, and clean, with the different members clearly defined	5
32. "The Thigh."—Should be broad, well developed, and muscular	5
33. "The Hock."—Should be broad in front, strong, and clean, with its different members clearly articulated. It should be nearly straight to the ground, but not too straight; the hock when too straight is apt to thorough-pin	5
34. "The Legs."—The fore-legs should be short, straight (not calf-kneed), wide set, well forward (not heavy in the shoulder), and properly proportioned	8
35. "The Bone."—Should be comparatively short, stout, but flat and clean (not knotty), broad under the knee and hock, not knee tied	4
36. "The Muscle."—Should be clean, clear of the bone, well-defined, and sinewy	3
37. "Feathering."—Long hair on the back parts of the legs, should be neither deficient nor too abundant as spreading round in front; where fine, long, and silky, it is, with a fine skin, indicative of good breeding	10
38. "The Pasterns."—Should be rather stout and short, with well-developed muscles, and set straight and at the proper angle	3
39. "The Feet."—Should be fair-sized, rather large, well-shaped, neither too open nor too close at the heels—giving evidence of strength and freedom from internal trouble, and they should be straight and fair, neither turned in nor out at the toes, but better a little in than out. White feet are objectionable, though common	12
	250

HACKNEY OR TROTTING ENTIRE—POINTS OF THE HACKNEY ENTIRE.

Description of the Points, and their Values.

	Single Points. Aggregate.
I.—PEDIGREE AND PERFORMANCE OR OFFSPRING.	
1. "Pedigree."—To be viewed in the light of the standing of the horse in the Stud Book, or as proved by certificates and declarations	20
2. "Performance or Offspring."—According to the records of performance, or of prizes gained by progeny	20

POINTS OF THE HACKNEY ENTIRE—*continued.*

	Single Points. Aggregate.
II.—GENERAL CHARACTER, STYLE, AND ACTION.	
3. "General Character."—That indescribable beauty and elegance of the outline and form (in rest) in an animal which is seen at a glance, and which, when combined with the next point, indicates purity of blood and high breeding	10
4. "Style and Carriage."—The natural and unrestrained carriage of the head, neck, and tail, and the movement of the limbs, as presented in a state of animation, which, with the preceding point, indicate high breeding	10
5. "Action."—This will embrace the action and use of the limbs at the walk and slow trot, in which the difference between a dragging motion and a quick, tappy lifting of the feet will be considered. The right use (bending) of the knee and hock is a necessity	10
III.—COLOUR AND SIZE.	
6. "Colour."—According to public taste, the leading colours may be classed as follows: Bay, dark chestnut, brown, black, roan, grey. All white markings, beyond a star and one or two white feet, are objectionable	5
7. "Size."—This will be determined by the class to which this scale is applied. The model park horse is the model farm horse, and he should be 16 hands high, weighing 1,200 lbs.; the road and trotting horse not less than 15½ hands, and other breeds according to their uses	10
IV.—HEAD.	
8. "Ear."—Active, thin, and generous in length. The action of the ear, with the eye, discloses character	3
9. "Face."—The head, as a whole, should be in proportion to the size of the horse. It should be broad between the eyes, with prominent brain development, clean and bony ...	8
10. "Eye and Expression."—This organ and the ear shows character; and not only the fulness of the eye, but its character must be studied. It should be bright, mild, lively, and truthful	9
11. "The Jaws."—The jaws should be wide apart, to give ample room for the windpipe	2
12. "The Lips."—Should be neat and compressed, and not open or hanging down	1
13. "The Nostril."—Should be wide, high, active, and delicate ...	2
V.—FORE-QUARTER.	
14. "The Neck."—This point will include the setting-on of the head, the length and shape of the neck, the free development of the windpipe (especially at the throttle), and the junction of the neck with the shoulders and breast. It should be somewhat long and slightly arching	10
15. "The Breast."—Should be sufficiently full and deep to give ample room for the heart and lungs, but not so heavy as to interfere with speed	5

Points of the Hackney Entire—*continued.*

	Single Points. Aggregate.
V.—Fore-Quarter—*continued.*	
16. "The Withers."—Should be high to give safe action, muscular, and sloping evenly into the shoulder	4
17. "The Shoulders."—Should be strong and muscular, well laid back, and should rise with a clean and even slope towards the withers	6
18. "The Fore-ribs."—Should be round (hooped), deep, and full. There must be ample room for the heart to beat and the lungs to play. Deficient in this respect, his stock will lack vigour of constitution and staying powers	5
19. "Chest."—Should be deep and well-developed, and should run evenly into the shoulder—not chest-tied	5
VI.—The Middle.	
20. "The Back."—Should be comparatively straight and broad, and should run full, wide, and level into the loins	6
21. "Back-ribs."—Should spring roundly in an arch from the backbone, and run well back towards the hind-quarters—*i.e.*, well ribbed home—and the last ribs should be round and well let down	6
22. "The Belly."—Should be fairly let down, but not be pot-bellied, nor too much tucked up, and with sufficient room for food	3
23. "The Loin."—Should be full, long, level, and broad, extending along the back, to give strength to the horse	6
24. "The Flank."—Should be clean, neat, and fairly developed ...	2
25. "The Sheath."—Should be well-developed	2
VII.—The Hind-quarters.	
26. "The Hips."—The hip bones should be well apart, not protruding, but symmetrical	3
27. "The Quarter."—Should be broad and strong, the stifles well apart and wide when viewed from behind, with well-turned buttocks	7
28. "The Croup."—Should be long and comparatively level, but with proper elevation, sloping towards the tail	6
29. "Tail and Set-on."—The tail should leave the croup and be carried gracefully at the proper height, with free, soft, but strong hair	9
VIII.—Legs, etc.	
30. "Forearm."—Should be muscular and well-developed ...	5
31. "The Knee."—Should be comparatively large and strong and clean, with the different members clearly defined	5
32. "The Gaskin, or Thigh."—Should be broad, well-developed, and muscular	5
33. "The Hock."—Should be strong and clean, with its different members clearly articulated and nearly straight to the ground	5
34. "The Legs."—Should be short, straight, wide-set, well forward (not heavy in the shoulder), and properly proportioned ...	13

POINTS OF THE HACKNEY ENTIRE—*continued.*

	Single Points. Aggregate.
VIII.—LEGS, ETC.—*continued.*	
35. "The Bone."—Should be comparatively stout, but flat, etc., broad under the knee and hock—not knee-tied	4
36. "The Muscle."—Should be clean, clear of bone, well-defined, and sinewy	3
37. "The Pasterns."—Should be rather stout and short, with well-developed muscles, and set straight and at the proper angle	3
38. "The Feet."—Should be fair-sized, rather large, well-shaped, neither too open nor too close at the heels—giving evidence of strength and freedom from internal trouble—and they should be straight and fair, neither turned in nor turned out at the toes	12
Aggregate	250

DAIRY CATTLE.—POINTS OF JERSEY CATTLE.

Description of the Points, and their Values.

	Bull.	Cow.
I.—PEDIGREE.		
1. "Pedigree."—According to standing in Herd Book, or as proved by certificates and declarations	20	20
2. "Offspring."—To be viewed from the character of the offspring, as shown by their success at shows ...	20	20
II.—STYLE, ETC.		
3. "Style and Character."—The general appearance, including style, character, and movement (the step should be short, quick, and jaunty), should indicate purity of blood and high breeding, the whole figure being at the same time compact and well proportioned	10	10
III.—SIZE.		
4. "Size."—The average live weight should be about 12cwt.	5	5
IV.—QUALITY.		
5. "Colour."—Silver grey, of a light shade, or a light lemon fawn, free from white markings	7	7
6. "Bone."—Light and clean under the knee	3	3
7. "Hair."—Fine, soft, close, and wavy	4	4
8. "Skin."—Rather thin, elastic and movable, but not too loose	6	6
9. "Horns."—Smooth, crumpled, not too thick at base, tapering, and tipped with black	3	3
10. "Ears."—Small, thin, and of a deep orange colour inside	2	2

POINTS OF JERSEY CATTLE—*continued.*

	Bull.	Cow.
IV.—QUALITY—*continued.*		
11. "Head and Face."—The head should be small, fine, and tapering, with hollow forehead, and dished face and small cheek	5	5
12. "Eye and Expression."—Full, placid, gentle, and deer-like	5	5
13. "Nostril."—High and open	2	2
14. "Muzzle."—Large, and encircled with rich, light, orange-coloured hair—more particularly in young stock ...	3	3
V.—FORE-QUARTER.		
15. "Neck."—Straight, fine, placed tightly on the shoulders, and free from loose skin on the throat, fine at the junction with head, and enlarging symmetrically towards the shoulders	9	5
16. "Breast and Brisket."—Fairly full and deep	6	5
17. "Crops and Withers."—Light, but evenly filled ...	12	5
18. "Shoulder."—Sloping, and fairly covered with muscle	4	3
19. "Forearm."—Swelling, and full above the knee ...	4	2
20. "Chine."—Light, but symmetrical and well-defined ...	3	3
21. "Fore-ribs."—Gradually increasing in width and depth backwards, and standing well out from the spine ...	4	4
22. "Fore-flank or Chest."—Deep, and running evenly out from shoulder	3	3
VI.—MIDDLE.		
23. "Back."—Straight from the withers to the top of the hip, and from the top of the hip to the setting-on of the tail	5	4
24. "Back-ribs."—Hooped, deep, and round, and well ribbed home	6	4
25. "Belly."—Capacious, but not low in the middle, *i.e.*, pot bellied	4	2
26. "Loin."—Long, broad, level, and well covered	9	6
27. "Flank."—Well let down	4	4
VII.—HIND-QUARTER.		
28. "Hip."—Wide, but not protruding	4	2
29. "Rump."—Long, broad, and straight	7	5
30. "The Tail."—At right angles with the back, full, and hanging down to the hocks	4	3
31. "Quarter."—Large, and wide behind	9	5
32. "Thigh."—Deep, broad, and well-developed	6	5
33. "Twist."—Running well up, wide and roomy	5	5
34. "The Mirror and Escutcheon."—Should be large and well-developed, and the higher the better	10	5
35. "Testes."—Large	5	...
36. "The Teats."—Moderate size, well apart, and not on scrotum	15	...
37. "Udder."—Full (but not fleshy) in form, *i.e.*, well forward, in line with the belly, and well up behind ...	...	40
38. "Teats."—Moderate size, large enough to be held in the full hand, squarely placed behind, and wide apart	...	10
39. "Milk Veins."—Very prominent, and well-developed about udder and abdomen	...	15

POINTS OF JERSEY CATTLE—*continued.*

	Bull.	Cow.
VII.—LEGS, ETC.		
40. "Knee and Hock."—Knee clean, firm, and fairly developed, and the hock long and broad, and nearly straight to the ground	4	4
41. "Legs."—Below the knee short, straight, and clean, and well under the body, and the hind legs squarely placed, not too close together when viewed from behind, must not cross in walking	4	4
42. "Hoofs."—Small, rather long, and straight	2	2
	250	250

DAIRY CATTLE.—POINTS OF AYRSHIRE CATTLE.

	Bull.	Cow.
I.—PEDIGREE.		
1. "Pedigree."—According to standing in Herd Book, or as proved by certificates and declarations	20	20
2. "Offspring."—To be viewed from the character of the offspring as shown by their success at shows ...	20	20
II.—STYLE, ETC.		
3. "Style and Character."—The general appearance, including style, character, and movement, should indicate purity of blood and high breeding, the whole figure being at the same time compact and well proportioned	20	10
III.—SIZE.		
4. "Size."—The average live weight should be about 14cwt.	5	5
IV.—QUALITY.		
5. "Colour."—This may be red (of any shade), brown, or white, or a mixture of these; each colour being distinctly defined; brindle, or black and white, is not in favour	6	7
6. "Bone."—Fine and clean under the knee	4	3
7. "Hair."—Soft, close, and woolly	3	4
8. "Handle."—Skin soft, mellow, and elastic	7	6
9. "Horns."—Horn large but not coarse, clear, wide-set, and inclining upwards	3	3
10. "Ears."—Rather large and lively	2	2
11. "Head and Face."—Head short, forehead wide ...	5	5
12. "Eye and Expression."—Eye, full and lively; expression, quiet and gentle	5	5
13. "Nose and Nostril."—Fine between eyes and muzzle; nostrils wide	2	2
14. "Muzzle."—Large and lustrous	3	3

POINTS OF AYRSHIRE CATTLE—*continued.*

	Bull.	Cow.
V.—FORE-QUARTER.		
15. "Neck."—Moderately long and straight from the head to the top of the shoulder, free from loose skin on the under-side, fine at its junction with the head, and enlarging symmetrically towards the shoulders	9	5
16. "Breast."—Light, but sufficiently broad to insure constitution	4	2
17. "Brisket."—Small, and whole fore-quarter light ...	2	3
18. "Crops and Withers."—Fine	12	5
19. "Shoulder."—Sloping, and fairly covered with muscle	4	3
20. "Forearm."—Rather large, straight, and muscular ...	4	2
21. "Chine."—Fine, but symmetrical and well-defined ...	3	3
22. "Fore-ribs."—Gradually increasing in depth and width backwards, and standing well out from the spine ...	4	4
23. "Fore-flank and Chest."—Deep, and running evenly into the shoulder	3	3
VI.—MIDDLE.		
24. "Back."—Short and straight, and on the same level as the chine and loin	5	4
25. "Back-ribs."—Arched and wide, running back to the hind-quarters, *i.e.*, well ribbed home	6	4
26. "Belly."—Capacious	4	2
27. "Loin."—Broad, level, and long	7	6
28. "Flank."—Well let down	3	4
VII.—HIND-QUARTER.		
29. "Hips."—Hoop, or hoop-bones, should be wide apart, and not covered with fat	4	2
30. "Rump."—Long, broad, and straight	7	5
31. "Tail and set-on."—Long, slender, set on level with the back, and not running up the rump	4	3
32. "Quarter."—Large, and wide across behind	9	5
33. "Thigh."—Deep and broad, but thin of flesh on the inner side or twist	6	5
34. "Twist."—The space between hind legs, wide and roomy, and running well up	5	5
35. "Mirror and Escutcheon."—Large and well-defined; the higher the mirror the better	10	5
36. "Testes."—Large, and white colour	5	...
37. "Teats."—Well apart, and not on the scrotum ...	15	...
38. "Udder."—Full (but not fleshy) in form, *i.e.*, well forward, in line with the belly, and well up behind ...	...	40
39. "Teats."—Moderate size, large enough to be held in the full hand, squarely placed behind and wide apart ...	...	10
40. "Milk Veins."—Very prominent and well developed about udder and abdomen	...	15
VIII.—LEGS.		
41. "Knee."—The knee clean and firm, and fairly developed	2	4
42. "Gambril or Hock."—The gambril clean, long, and broad, and nearly straight to the ground	2	...
43. "Legs."—Short in proportion to size, straight and clean, hind legs well apart	4	4
44. "Hoof."—Clean, short, and well proportioned	2	2
	250	250

BEEF CATTLE.—POINTS OF SHORTHORN BULL OR COW.

Description of Points and their Values.

NOTE.—The following scale will do equally well for bulls and cows, Herefords, Devons, Black Polled Angus, or any beef breed, due allowance being made for difference in colour, horns, testes, and minor parts.

	Single Points Aggregate.
I.—PEDIGREE, ETC.	
1. Pedigree.—According to standing in Stud Book, or as proved by certificates and declarations	16
2. Offspring.—The character of offspring as shown by their success at shows	16
II.—CARRIAGE, ETC.	
3. Style and Carriage.—Is that indescribable beauty and elegance of form, character, and carriage in an animal, which is seen at a glance, and which, with the lines of the body flowing, not sharp or abrupt, denotes purity of blood and high breeding	10
III.—SIZE, ETC.	
4. Size.—The preferable size is a medium one approaching to large, as extra large animals are, as a rule, less hardy and require proportionately more and better food	6
5. Vigour.—Is indicated by width of forehead, well-developed neck and horns, roundness and capacity of barrel, and robust and muscular appearance	10
QUALITY.	
Quality may be described as certain external properties, which may be seen and felt, indicative of high breeding, a disposition to early maturity, and of having the frame—especially in the prime parts—covered with valuable meat, and the fat evenly distributed throughout the whole carcass. Of quality there are two subdivisions: (1) General Quality, and (2) Head; while in the former subdivision there are 6 points, namely:—	
6. The Bone.—As shown in that of the leg under the knee, should be fine, but not so fine as to indicate weakness of constitution. Coarseness of bone is incompatible with quality. The reason for this is plain. In coarse, large-boned animals a great proportion of the nutriment in the food goes to making and supporting bone, which in the fine-boned beast makes meat...	6
7. The Colour.—Should be any variety of red and white, as roan, or red with white, or altogether white. The richer the colour the better; but red inclining to black, or light red inclining to yellow, is objectionable, as well as red and white spotted	4
8. The Hair.—Should be fine, long, wavy, silky, and abundant, with soft mossy undergrowth	6

POINTS OF SHORTHORN BULL OR COW—*continued.*

	Single Points Aggregate.
QUALITY—*continued.*	
9. The Handle, *i.e.*, touch and handle.—The position of an exhibit with respect to touch is ascertained by a slow, comparatively light but firm pressure with the points of the fingers on the different parts of the animal, especially along the chine, back, ribs, loin, and rump, and on the hip or hook bones; and if it be in fair condition and stands well in this point, the feeling under the fingers will be firm but yielding, which indicates the existence of fat between the skin and flesh, and aptitude to fatten. The flesh itself should be yielding and elastic, especially on the ribs, points of the rump, and at the setting on of the tail. In handling, the thickness and elasticity of the skin are to be ascertained. It should be of medium thickness and not so thin as to indicate that the animal can undergo no hardship; neither should it be loose, but movable, mellow, soft, yielding, and elastic	12
10. Evenness of Flesh and Fat.—The meat should be evenly, fairly, and deeply laid on over the whole carcass, especially on the prime parts, and the fat should be fairly distributed throughout the whole. Patchiness on the shoulders, ribs, loin, or rump—especially on the last—is a decided fault in young stock, for the fat, instead of being evenly distributed throughout the carcass, as indicated by the marbled appearance of first-class meat, is nearly all collected at the patchy parts	7
In Head—the second subdivision of quality—there are seven points, which may be described as follows:—	
11. The Muzzle.—Should be broad, full, and dewy. The colour should be cream, orange, or light drab, but never smoky or black, which indicate inferiority of blood	3
12. The Nostril.—Should be wide, high, and open	2
13. The Forehead and Face.—The forehead should be short and broad, denoting vigour, while in the cow it should be longer and narrower. The face should be comparatively short, lean of flesh, and somewhat dished or concave	5
14. The Eye.—Should be prominent, bright, mild, lively, and trustful; and the expression should be cheerful, open, gentle, and contented	4
15. The Horn and Ear.—The horn should be comparatively short, moderately thick, well shaped, flattish and waxy, not clean and white, nor blackened, except at the very tips. It should incline outwards and not much upwards. The ear should be large, thin, yellowish inside, erect, lively in action, and hairy	7
FORM.	
Form may be described as symmetry and utility of carcass—*i.e.*, a handsome, well-developed, healthy frame, with lines straight above and below, and fulness and largeness in all the prime parts, and smallness in the inferior and offal.	

POINTS OF SHORTHORN BULL OR COW—*continued.*

FORM—*continued.*

Of Form again, there are four subdivisions: 1, forequarter; 2, middle; 3, hind-quarter; and 4, legs, etc.; and in the first of these subdivisions—fore-quarter—there are nine points, namely:—

IV.—FORE-QUARTER.

	Single Points. Aggregate.
16. The Neck and Throat.—The neck should be clean, somewhat long and arching (bullheaded), which shows strength and masculine vigor, a most essential point; but the rise of the arch of the neck should never extend to the shoulders, and the neck should be fine at the setting on of the head. The neck-vein ought to be well developed, and should run full and evenly into the shoulder. The throat should be fine, clean, and free from superfluous skin	8
17. The Breast.—The space between the forelegs, viewed in front, should be wide, full, and swelling, indicating thickness through the heart and capacity of chest	4
18. The Brisket.—Should be full, deep, broad, and projecting forward in front of the leg, and downward nearly to the knee. There should be no dew lap beyond a slight pendulous thread. Although a deep brisket is not an absolute guarantee of a deep chest, the two generally go together. A deep brisket is not always to be met with in well shaped cattle, but it is indicative of a propensity to fatten... ...	3
19. The Crops.—The top of the shoulder should be full and well covered with flesh, but not too wide. If they are very thick, straight, and open, the animal will never have good action	4
20. The Shoulder.—Should be well developed, and covered with muscle from its point to the crops. The shoulder-blade should be fairly laid back to insure action and a good foreflank. A too upright shoulder invariably entails a protuberant bare shoulder point and meagre foreflank—both bad faults	8
21. The Forearm.—Should be broad, large, straight, and muscular	3
22. The Chine.—The space between the crops and back should be round, and so full as to leave no hollow behind the shoulder. Nothing can compensate for a deficiency in this respect. It takes away substance from one of the very prime parts. On the top, the chine should be on a level with, and run well into the back	9
23. The Fore-ribs.—Should be round (hooped), deep and capacious throughout, running down wide and deep to give plenty of room for the heart and lungs. They should especially stand well out behind the shoulder. A bull with bad fore-ribs and a narrow, contracted chest—hollow behind the shoulder—should be set aside, whatever other good qualities he may possess. "There must be ample room for the heart to beat and the lungs to play, otherwise sufficient blood for the purposes of nutriment and strength will not be circulated, nor will it undergo the vital change which is essential to the proper discharge of every function." Deficient in this respect, he is literally a "bad hearted" animal, and his stock will lack vigour of constitution, and be liable to succumb to disease	5

POINTS OF SHORTHORN BULL OR COW—*continued.*

	Single Points. Aggregate.
IV.—FORE QUARTER—*continued.*	
24. The Fore-flank.—Should be deep and well developed, and should run full and evenly into the shoulder	6
V. MIDDLE.	
In this sub-division there are five points, which may be described as follows :—	
25. The Back.—Should be straight and broad, and on the same level as the chine and loin. It should be well covered with flesh, and should run full and wide into the loin	5
26. The Back-ribs.—Should spring roundly into an arch from the back, and run well back towards the hind-quarters, so as to leave little space between the ribs and the hips or hooks, *i.e.*—to be well-ribbed home (a most-essential point), while the two or three last ribs should be broad, arching, and well let down	8
27. The Belly.—Should neither be tucked nor too low in the middle—that is, pot-bellied,—but roomy and fairly let down, giving space for a capacious paunch. There should be room for ample materials to keep up the necessary supply of blood	
28. The Loin.—Should be full, long, level, broad, and well covered with flesh. When properly developed, it should appear to extend far along the back. It is a prime part of the carcass, besides giving additional strength to the animal; and in moderately fat animals, at least, it is one of the points by which a purchaser is guided in judging as to their condition	10
29. The Flank.—Should be full, swelling, low, and deep. This is, too, one of the chief points noticed by the buyer in judging as to the condition of cattle, and ought, for this and other reasons, to be cultivated	10
VI. THE HIND QUARTER.	
In this subdivision there are seven points, which may be described as follows :—	
30. The Hip or Hook.—The width measuring from the crown of one hip-bone to that of the other should be comparatively wide, but not protruding nor too large. It should be on a level with the loin and rump. The hip bones should be well covered and feel comparatively soft to the touch ...	3
31. The Rumps.—The length from the crown of the hip to the point of the true rump, and the width across behind from point to point, should be long and wide, square, and level on the top, with the space between the hip and the tail and the points of the rumps well filled up with flesh and fat, without patchiness or gaudiness. A wide, long, level, well filled-up rump, and a good handle at the tail and haunch, are sure indications that the animal is of the right sort; and these points are also of importance through the meat on them being all of the primest quality	10

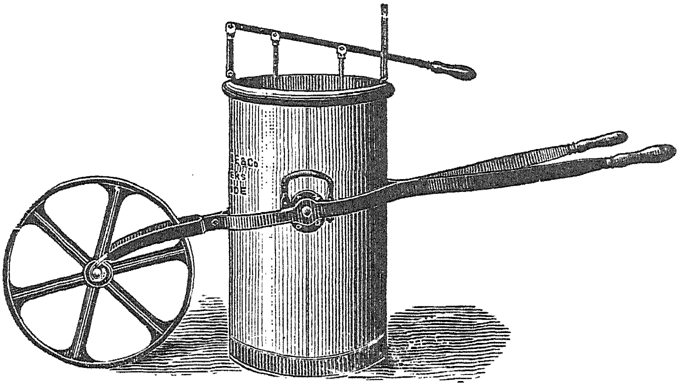
POINTS OF SHORTHORN BULL OR COW—*continued.*

	Single Points. Aggregate.
VI.—THE HIND QUARTER—*continued.*	
32. The Tail and Set-on.—The tail should be set symmetrically on a level with the rump, loin, and back. It should be strong and broad at the root, but rapidly tapering to fine and round at the brush. It should, when not raised, fit neatly in between the points of the rump bones. It should neither rise at the root, with a cock or curve, above the level of the rump, nor should it run far up the rump, nor droop, *i.e.*, it should be set square on	7
33. The Quarter.—The length and width below the rump and above the thigh should be wide, level, and square. It should come down straight and full to the thigh, but it should not be hairy nor rounded like that of a horse, which is a sure sign of coarseness	6
34. The Thigh.—Should be broad, strong, short, and well developed	4
35. The Twist.—The filling up between the thighs should be full, broad, well filled, making the thighs meet low down	8
36. The Testes or Udder.—Should be well developed	2
VII. LEGS, ETC.	
In this subdivision there are three points, which may be described as follows:—	
37. The Knee and Gambril, or Hock.—The (fore) knee should be broad in front, clean, and well developed. The gambril (or hock) should be long, broad, clean, muscular, and nearly straight to the ground	7
38. The Leg.—Should be short, straight, wide set, clean, and well proportioned; and under the knee and gambril it should be moderately fine and sinewy	2
39. The Hoof.—Should be clean, short, and well proportioned	1
	250

SPRAYING AND FUMIGATION.

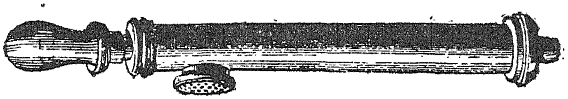
SPRAYING PUMPS.

Previously to the appearance of mildew in the European vineyards, the only spraying pumps known were somewhat after the fashion of those toy scent-atomizers used by hairdressers, and were almost entirely used in conservatories, for spraying rare and exotic plants. Since then, however, the necessity of dressing vines with mixtures containing copper salts, and other insecticides, has led to the more general use of specially designed pumps that distribute the liquid with greater rapidity and under the form of minute globules in a fine spray.



Barrow Spray Pump.

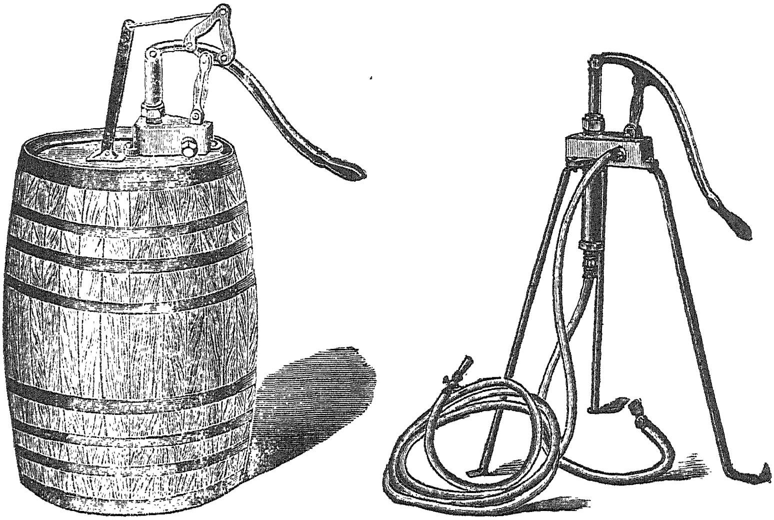
How it should be made, and points to consider.—An authority on the matter thus expresses himself:—Price and weight must be considered. A cheap pump, that will handle clogging and corrosive mixtures all the time, and be simple enough to stand the rough using of farm and orchard hands, who know little more about spraying than to work the pump-handle, is not very easy to get. All parts of component spray pumps must be of the very best and suitable description—hose, nozzle, means of controlling the supply from pumps, elevating the nozzle, etc.



Garden Syringe—the simplest Spray Pump.

Iron is unfit material for spraying pumps, sulphate of copper destroying the nice adjustment of the working parts. So far, brass has given most satisfaction, and all working parts and all valves in contact with the spraying material should be of that or other non-corrosive material. Soft brass, composed of copper and zinc, should be avoided, as it is corroded by ammonia. Leather valves soon become hard and unyielding. All parts should be strong and easily reached for repairs, replacement, or cleaning.

As nearly as possible, all power expended ought to be applied in forcing the material, in hand-work especially. Some pumps, intended to be mounted on a barrel, are so constructed as to make the whole apparatus top-heavy and liable to accidents. It often happens that too much suction is also required to bring the liquid into the cylinder, whereas nearly all the work of the piston ought to be expended in forcing it. The cylinder is best at the bottom of the barrel, immersed in the liquid, where there is little or no suction until the barrel is nearly empty, the liquid itself doing the office of packing, instead of rubber, candle-wicking, leather, etc.



Nixon's Climax Pump on Barrel and on Tripod.

The automatic stirring apparatus should be so perfect that the last spray that leaves the nozzle is as strong and no stronger than the first. Paddles worked by motion of the handles, causing up and down currents, involve less loss of power than when a portion of the liquid returns from the pump to the barrel.

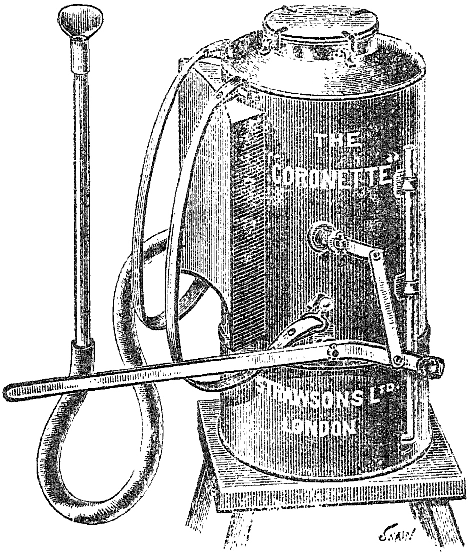
Keep trash, leaves, and sticks out of the barrel by means of a lid. The supply pipe leading from the pump should be provided with a quick-acting valve, so as not to cause loss of spray when not in use, and for facilitating the removal of any clogging of nozzles set without loss of time, waste of material, and deluging the workmen.

The hose should be strong; ½-inch inside. A smaller diameter would cause too much friction; a larger one would make the hose very heavy when full of material. It is a source of annoyance that universal gauge threads are not used by all makers, as in the case of microscopes.

Mechanical ingenuity has devised appliances for the even distribution of impalpable powders as well as for the spraying of liquids; amongst these is the machine here illustrated.

A strong blast of air is created by moving the lever, which carries the powder through a piece of indiarubber piping, terminated by a tin tube, 3ft. in length or more, and having at its end a flattened circular piece of tin. The blast, after impact on the piece of tin, spreads out in a fanlike shape, and distributes the sulphur or powder evenly in the form of a cloud. The machine, which costs 30 francs in France, is easily kept in working order; all that is required is, besides emptying the reservoir after using, an occasional oiling of such parts of the lever where friction occurs.

This sulphurer distributes fungicide or insecticide powders more evenly and in a finer state than the ordinary bellows.

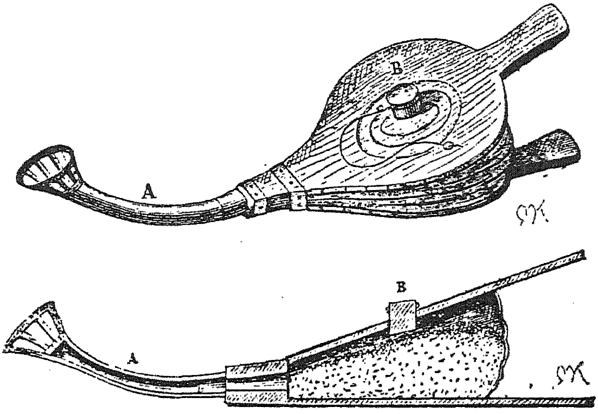


The "Coronette" portable Sprayer.

To produce a similar effect, less powder is distributed over a given area, thus effecting a great economy.

The powder is applied with more force, and has a better chance of adhering to all the leaves, while the working is easier than in the case of ordinary bellows.

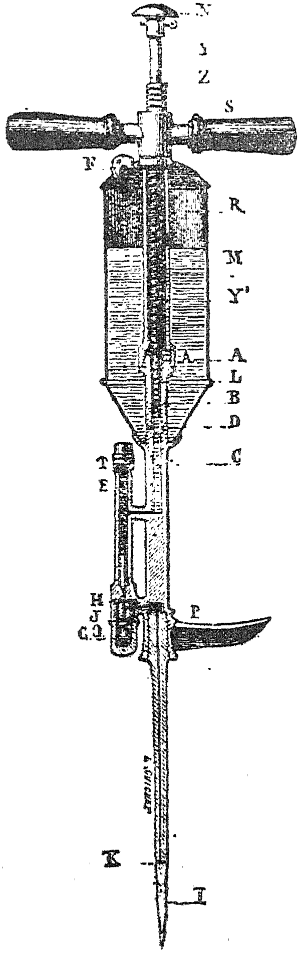
Simpler and cheaper powder casters are also illustrated, and consist in the old-fashioned but efficacious sulphur bellows, the construction of which is shown in the following diagrams.



Sulphur Bellows.

Vermorel's Injector for Carbon Bi-sulphide.—Among the numerous insecticides proposed and experimented upon for destroying the phylloxera and other ground pests, carbon bi-sulphide has been found the most reliable as well as the most efficacious. It is a colourless liquid, heavier than water (1·271 at 15 deg. C.), very volatile (boils at 48 deg. C.=102 deg. F.), and catches fire very rapidly. Workmen using it should, for this reason, carefully refrain from smoking, and avoid carrying matches.

Considerable difficulty was experienced at the beginning in the application of the insecticide round the roots, and in properly regulating its dose, until specially designed forcing-pumps came into use, one of the best of which is here shown.



Vermorel's Injector.

The forcing-pump considered, so far, the best for the purpose of injecting the insecticide liquid into the soil is the one here described, and is manufactured by Vermorel. Its price in France is about 55 francs.

It consists of a copper reservoir R, holding about a quart of the liquid, which is introduced through the opening F, closed by means of a screw plug. The piston Y Y, surmounted by the knob N, works in the pump A, and is fitted at its extremity with a cup-shaped leather cap B. A spring, M, drives the piston upwards each time it has been pressed down in injecting the liquid. Underneath the piston, two small openings, D, place the reservoir in communication with the chamber T. On pressing the piston down, the bi-sulphide of carbon is driven into the tube E, and by pushing a plug, J, fills up the chamber G, whence it is forced out of the steel needle I, through the opening K, into the soil.

In order to regulate the dose of bi-sulphide of carbon at each injection, one or more rings, Z, are strung on the piston rod. The pump is so graduated that each time the piston is pressed down 10 grammes (154 grains, or ⅓oz.) is injected into the ground. In other words, supposing one injection is made in every square yard: 4,840 square yards multiplied by 10 grammes equals 48·4 kilogrammes, or 95·5lb., are injected per acre. With one ring added, 9 grammes are injected, or $\frac{1}{10}$th less; with two rings 8 grammes only are injected; and so on, each additional ring added decreasing the dose by $\frac{1}{10}$th.

The apparatus, having received a charge of bi-sulphide of carbon, is easily thrust into the ground by pressing on the handles S, and the spur P. The knob N, is then pressed down, and a dose of the liquid injected into the ground. On removing the needle the operator stops the hole left in the soil with his heel, and the volatile insecticide, being thus imprisoned in the soil, diffuses through it, penetrates every cleft and rent, and reaches the enemy, which it soon suffocates. The eggs, however, are not destroyed, and a fresh application after hatching, and within a fortnight, has to be made to entirely rid the ground of the pest.

According to the degree of intensity of the invasion, one or two injections per square yard are made, or, in other words, the knob of the piston is pressed down two or three times.

Between the lines the steel needle is thrust in full-length into the ground, viz., 8 to 10 inches; but nearer to the stocks half that depth is sufficient.

Bi-sulphide of carbon is used with best advantage in porous soils, whilst on heavy clays, or in shallow soils with a clay subsoil, at a depth of 10 to 12 inches, its application is not attended with the best results, as the insecticide cannot permeate through the mass of the ground, and, by being brought into direct contact with the roots, proves injurious to the plant.

How and when to Spray.

Credit is due for much of the information contained in this chapter to the contributions of Dr. N. A. Cobb, the Pathologist of the Department of Agriculture, Sydney, and published in the *Agricultural Gazette* of New South Wales.

Mature plants wear an armour of dead cells. These represent the outside skin or cuticle, which lines the upper and under surface of the leaves, and afford protection to the more tender cells which underlie them.

When observed under a microscope they are not unlike a thin parchment or small scales of bark. Owing to their presence, wind, rain, sun, or dust have no action on the more delicate internal living cells, which would soon be destroyed by handling or exposure were it not for this natural jacket which covers them. This jacket or covering is not, however, absolutely continuous, and small microscopic breathing-pores or stomata occur at intervals on the surface.

Let us suppose such a leaf to be attacked by a fungus parasite. If thin shavings of such a diseased leaf were cut by means of a specially made microscopic razor called a "microtome," and one of these thin slices was put under a microscope, we would see a section of the leaf showing on the outer edges one row of scales of the cuticle, disposed somewhat like bricks or tiles, and in the centre a mass of more tender living tissue, disposed somewhat like a close-grained sponge, and through which the sap circulates.

Now, in the case of a diseased leaf, we see permeating the living tissue a meshwork of filaments, which are the roots of the fungus, and are called mycelial threads; then, emerging through the breathing pores of the plant, slender, threadlike stems showing on the surface of the leaf, and on each of these threadlike stems little branches carrying small sacks full of spores or of seeds of the fungus.

Thus we see that a parasitic fungus robs the plant, through its mycelial threads, of the sap and the food which is pumped up by the plant from its roots to the extremity of its branches for the nourishment of its foliage and its fruit. In order to understand the usefulness of spraying with fungicides, we must not lose sight of these facts. The internal cells of the leaf are so delicate that the application to them of a poisonous substance, even though in a very diluted form, would prove injurious. But those internal cells are covered over and protected by the outside layer of thick-walled impermeable cells just mentioned, which would be able to bear the effect of the poison in a stronger form. Of course, it will be understood that a very strong poison would effect these outside cells also, but there is a certain strength of the poison, slightly stronger than would be injurious to delicate cells, that can be applied to them with impunity. It so happens that the cells of fungi are as a rule very delicate, and highly susceptible to the destructive influence of poisons in solution; and, often, such solutions as would not be injurious to the outside thick-walled cells of leaves are quite fatal to fungus cells.

Tender leaves as a rule are, for reasons detailed in the foregoing paragraph, less resistant than older leaves of the same plants; and, again, some sort of trees, such as the peach or the nectarine, having a thinner and more delicate cuticle than the apple or the pear, are sometimes injured by the application of poisonous liquids that would not hurt the more resistant plants.

Again, the facts brought to light here explain why, in a great many cases, several sprayings are necessary for eradicating disease. The application of a remedy will often only destroy that part of the fungus parasite which shows outside, but fresh shoots will soon be pushed out by the mycelial threads which permeate the more delicate internal tissues of the leaf, and soon carry a fresh crop of spores or fungus seeds, unless by timely treatment the parasite is again destroyed.

Many fruit-growers and farmers, however, who have no conception of these facts, are not satisfied unless a remedy costing next to nothing is offered to them, which will in one application destroy the enemy for ever. The mode of attack of the parasite, explained above, will explain how unreasonable such an expectation is; as a remedy that would affect this end at one stroke would probably, at the same time, destroy the tissues of the leaves.

"The application of fungicides does not effect a cure," says Dr. Cobb, "it only prevents the fungus from fruiting and germinating. That part of the fungus inside the leaf can be killed only by killing the leaf itself."

Many fungicides and insecticides either consist of particles of solid matter in the form of powder as sulphur, or in suspension in water as Paris green, or partly in suspension and partly in solution as carbonate of copper in Bordeaux mixture. After a plant has been sprayed with one of these substances, therefore, it may be considered as being covered with an armour of solid poisonous substance, which will destroy by contact any fungus shoot that shows on the leaf or prevents its germination.

All armours, however, have their weak points, and the armour in which we dress our plants is no exception. Let us examine, says Dr. Cobb, into the weak points of our system of spraying, and see whether they are capable of being remedied. It requires no very lengthened experience in spraying to learn that different crops receive a spray in very different ways. The leaves of some crops may wet easily, but to one crop of this sort there are many that do not do so. Often the spray will be seen to collect immediately in drops, in spite of its fineness, when applied. This is due to the waxy covering with which many kinds of leaves and fruits are furnished. When the microscopic liquid particles, of which the fungicide is composed, come into contact with the bloom of the leaf, they refuse to adhere if the spraying is carried on too long, or they adhere so slightly that the attraction which adjacent particles have for each other comes into play, and causes them to roll up into drops of visible size (Fig. B).

The illustration shows two patches of wheat-leaves sprayed with the fungicide known as ammonio-carbonate of copper—that is, carbonate of copper dissolved in dilute ammonia. After a plant has been sprayed with this solution, the diluted ammonia evaporates and leaves the carbonate of copper in the shape of an exceedingly fine powder. Consequently, when we examine the surface of the sprayed plant with a microscope, we instantly notice this deposit distributed in patches, as shown in the adjacent illustration. Each patch of deposit is a dried-up droplet of the spray; about twenty such patches are shown in one illustration. Between the patches is seen that part of the wheat-leaf which was not hit by the spray. As long as the patches of poison remain they constitute a protection against the infection by means of spores, which may fall upon a sprayed leaf. A spore falling upon the poison will be killed as soon as it attempts to germinate. Even should it fall upon a portion of the leaf where there is no poison, growth may yet be prevented, as will be readily understood by examining the illustration, where the germination of spores *c*, *d*, *e*, and *f* has been checked, because their sprouts have run against the poison.

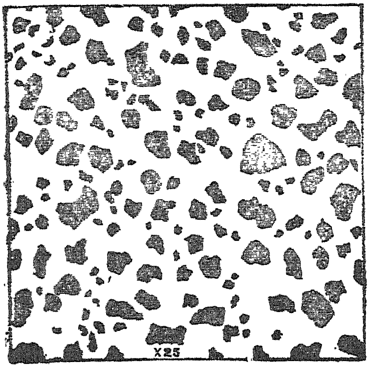


Fig. A.

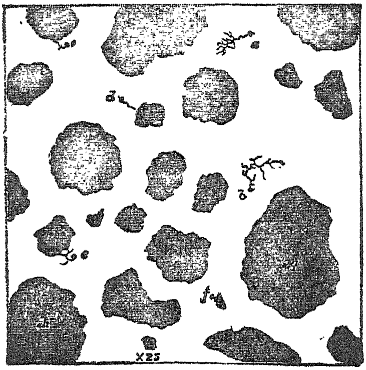


Fig. B.

In the above illustration a careful drawing is given of two different sprayings. In one case the leaf was sprayed for nine consecutive seconds; in the other case, also, for nine seconds, but at three different times of three seconds each, the leaf having dried between times. The results are very different. Where the spray was applied nine seconds continuously the drops have melted into one another, and left wide, unprotected blanks amongst them (B). It is evident, therefore, that Fig. A represents a more efficient method of spraying than B, not because more poison has been applied, but because it is in a finer state of subdivision. It will be seen at once that if the spores *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h* had fallen on A instead of B their chance of growing would have been much diminished. As it was, all but two spores were killed. These two (*a* and *b*), having alighted in the midst of large areas free from poison, were able to grow to their full extent.

Facts worth knowing.

The moral of this teaching is, therefore, never spray until the drops of the poisonous liquid drip down from the foliage; but spray rapidly, coming back on your steps spraying again rapidly, and again once more, allowing time for the liquid to evaporate in the interval. No more liquid will be used in spraying the area of ground to be protected by this method, whilst the time employed in spraying will be practically the same in each case, while the result will be widely different.

Two or three sprayings, at a fortnight's interval, are better than only one, and one spraying better than none. Spraying early in the season is much more efficacious than later.

Trees will sometimes be injured by being sprayed on a very hot and windy day: the best time to spray is either on a dull day, early in the morning, or, better still, towards the evening. If necessary, spray at any time except at blossoming time, and within three or four weeks of the fruit being sufficiently ripe for gathering.

Arsenical and copper mixtures are poisonous, and operators should therefore be particularly careful that the spray does not accidentally get carried over to themselves or their assistants. Other sprays are not poisonous, but offensive; and those using them will instinctively keep clear of them.

Whenever the spray pump has been used, and before it is put away for use next day or on a future occasion, it should be emptied, and scrupulously cleaned by running fresh water through it. The suction and delivery hose are unscrewed and drained. After drying the pump as far as possible, it should be carefully oiled, with neatsfoot oil preferably; kerosene oil is not so good; while vegetable oil is least to be recommended. A spray pump or a sulphurer well looked after will last for many years, and do the work most efficiently.

Never keep copper mixtures and solution standing in iron tanks, as it corrodes the iron; but use copper or wooden vessels.

Kerosene, carbon bi-sulphide, and mineral oils will perish india-rubber.

Keep the Paris green locked up, as it is poisonous; the same caution will apply to the other chemicals, generally speaking.

Be ready and begin early.

PLANT FUMIGATION.

The fumigation of trees by means of hydrocyanic acid gas is fast becoming more popular.

The success of the operation and its safety to the operators depend on the methods in which this fumigation is carried out. As very little is known about these methods by fruit-growers, a few directions will prove useful, together with more detailed information regarding the process of fumigation and the making and handling of the gas-tight tents.

WHAT AND WHEN TO FUMIGATE.

Fumigation by means of hydrocyanic or prussic acid gas is successfully used in the treatment of insect pests; it has little effect on blights of fungoid origin. Insects which can be more readily attacked are scales, red spider, mites, and aphides. Trees and plants can be fumigated at any season of the year. In the winter time deciduous trees can, without injury, be fumigated at any time of the day; they can also, when dormant, stand heavier doses of gas, as well as a longer period under the tent. Citrus trees require more careful treatment, and should only be fumigated on dull mornings or afternoons, or in the evening by moonlight.

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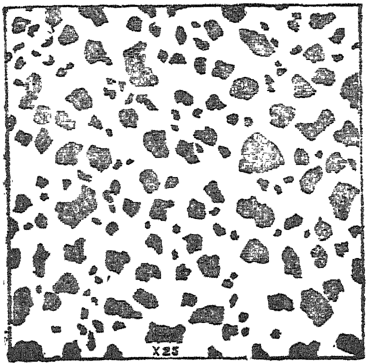
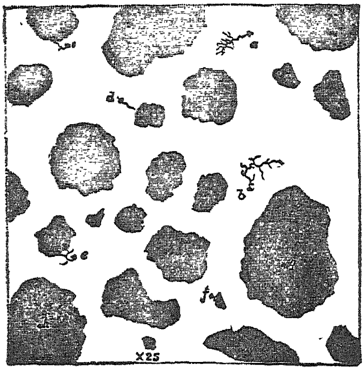


Fig. A.



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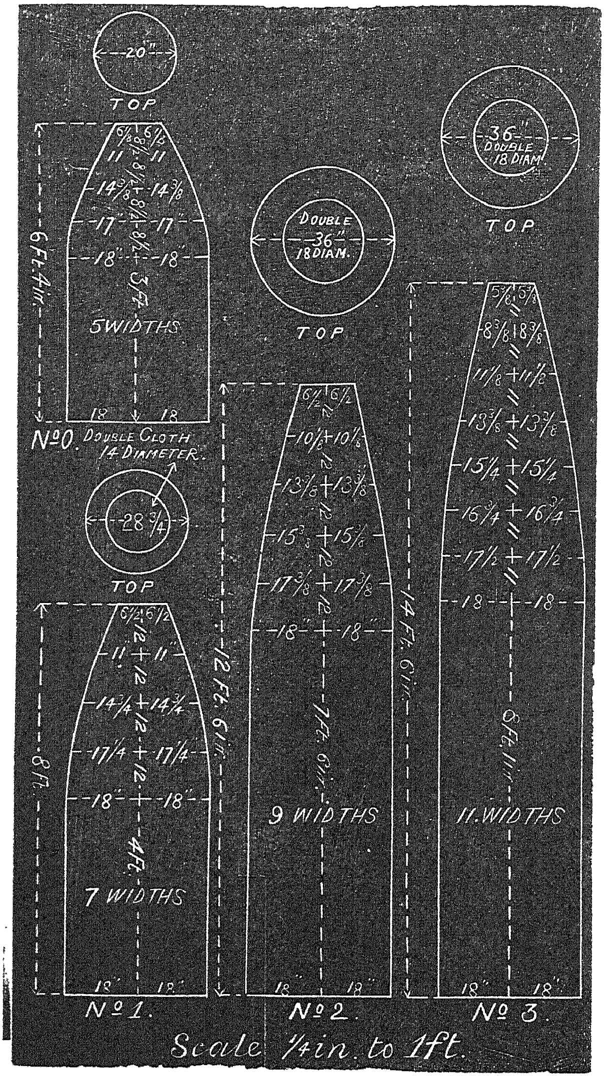
In the summer, when the trees are of active growth, they should only be fumigated late in the afternoon or at night.



Sketches of Bell Tents.

The above sketches of bell tents Nos. 0, 1, 2, and 3 show dimensions for cutting widths and tops. One inch is the width allowed for all seams. All measurements are given in feet and inches. No. 0 covers trees 4½ feet diameter by 5 feet high; No. 1 covers trees 6½ feet diameter by 7 feet high; No. 2 covers trees 8 feet diameter by 11 feet high; No. 3 covers trees 10½ feet diameter by 12 feet high. This diagram is taken from Mr. A. Benson's paper in the Queensland *Agricultural Journal.*

CAUTION TO OPERATORS.

Those using the process of fumigation for the treatment of scaly trees should bear in mind that they are handling, probably, the most insiduous and deadly of poisons.

The gas inhaled in a close chamber produces sudden death; when largely diluted with air it is harmless. Thousands of thousands of trees are now-a-days fumigated every year, and accidents are rare. With proper precautions there is no danger whatever.

Unless handling small tents covering trees 5ft. or 6ft. high, not less than two men should operate.

Not only is the hydrocyanic acid gas highly poisonous, but the ingredients or chemicals used in its production are also dangerous poisons. These ingredients are: 1° potassium-cyanide, of which a piece of the size of a grain of wheat would prove fatal to an adult or an animal; 2° sulphuric acid or oil of vitrol, which is eminently corrosive, and every precaution should be taken to guard against its spurting on the face, hands, or clothes.

When operating, hold your breath when dropping the cyanide into the acid, and also when removing the tent and uncovering the tree. See that the tents are always gas-tight. Should the acid accidentally spurt on your hands or face, wash at once in water.

Do not handle a clean tree, after having examined a diseased one, without previously washing your hands, as the eggs and larvæ of some of the scales are so small that they are easily carried from one tree to another by the growers themselves, or their men. I have often seen people crush scale insects on branches of trees, between their fingers, and then go to the adjoining tree and carelessly handle it and examine it for scales. Trees infested with the San Jose and the more dangerous sorts of scales should not be handled unless it is found necessary to do so.

FUMIGATING OUTFIT

consists of gas-tight tents made of light, strong canvas, cut and sewn together in a bell shape, and painted with raw linseed oil. A little turpentine added to the oil will cause it to dry quicker. When painting, spread the tent well by hanging it to the rafters of a shed or the branches of a tree, and leave it to dry thus spread out, lest the tissue of the canvas should heat and rot. Calico is rather a light material for the manufacture of tents; it wears badly, and requires constant patching up. Eight-ounce duck or ordinary blue or brown drilling, sewed carefully, are good materials. It is advisable to have rings at the sides and top of the tent, to ease it over trees by means of a light pole with a fork at the end. A light ½-inch gas-piping hoop, rung through rings at the base of the bell-shaped tent, is found convenient for covering and uncovering trees, and for keeping the tent stretched out. At the base of the tent, and below the ring, a gas-tight flange or canvas collar, about a foot wide, is provided, and rests on the ground. After the tent has been charged, this canvas collar is slightly banked up all round with earth, to prevent the gas escaping.

Before fumigating, inspect the tents. No hole, however small, should be allowed to go unpatched.

Trees too large to be covered with a tent may be fumigated under a large gas-tight canvas sheet.

Also provide yourself with:

1st. A common earthenware basin, 6 to 9 inches wide, according to size of tent or tree. 2nd. Scales for weighing the cyanide of potassium. 3rd. A graduated glass for measuring the fluid ounces of sulphuric acid and of water. 4th. If a gas-piping ring is not provided to keep the tent spread out at the base, have an 18ft. light pole, with rope and pulley, to hoist the larger tents over the tree. 5th. Sufficient number of 1oz. packets of cyanide of potassium, 98 per cent. purity, which must be kept in an air-tight jar. 6th. Sulphuric acid in a bottle with a glass stopper. 7th. Water.

How to reckon Cubic Capacity.

Consider the covered tree as a cylinder. To calculate its contents, multiply half the width by itself, then by the height; then multiply by 3, or to be more accurate, by 3⅐. Thus, a tree eight feet wide by eight feet high would be 4 x 4 x 8 x 3 = 384 cubic feet, or say 400 cubic feet. Cyanide of potassium, 1½ozs. per 100 cubic feet, would be 6 ozs., half as much again, or 2ozs. of sulphuric acid, with half as much again of water as acid, or 13½ozs., making a total of 28½ozs., or 7ozs. of the combined chemicals for every 100 cubic feet.

Doses and Time.

Cyanide of potassium, 98 per cent. purity, 1oz. per 100 cubic feet.

Sulphuric acid of commerce, 1½ fluid ozs. per 100 cubic feet.

Water, 2½ fluid ozs. per 100 cubic feet.

Note.—If fumigating in the winter for the more resistant scales, and particularly San Jose scale, the doses might be increased to: Cyanide of potassium, 1½ozs.: sulphuric acid, 2½ fluid ozs.; and water, 3½ fluid ozs. per 100 cubic feet.

The tree having been covered, one operator lifts the bottom of the tent; the other, after having poured in the earthenware bowl the quantity of water and acid (N.B.—Pour the acid slowly into the water to prevent spurting), crawls underneath and places that bowl under the tent, close to the trunk of the tree, but not touching it. Then, at arm's length, he breaks the paper cover of the cyanide of potassium and drops the number of packets required into the bowl, holding his breath meanwhile and crawling back; the tent is then let down, earth heaped up on the circular canvas collar, and the tent allowed to remain on the tree 45 to 60 minutes. Much of the poor work sometimes done is to be attributed to insufficient time.

N.B.—The mere fact of covering a tree in full growth by means of an air-tight tent, while the sun is up and the plant breathing, for an hour or two is enough to choke it and cause it to drop its foliage; therefore be careful to only fumigate, if in the growing months, in the cool of the evening or early in the morning. If the tree is dripping wet or is covered with beads of dew injury to the foliage might result.

When the time is over, the operator and his assistant uncover the tree by lifting the tent up, holding their breath while so doing; when another tree can be covered and treated without pausing.

Should a battery of half-a-dozen tents be in use, a considerable number of trees can be fumigated at once and without waste of time.

Bury the residue left in the bowl after fumigation.

NURSERY STOCK AND FUMIGATION.

Every nurseryman now finds a fumigatorium as necessary a part of his equipment as seeds, buds, and grafts.

The young trees should be subjected to fumigation before being distributed far and wide, as hydrocyanic gas is the only satisfactory and inexpensive method known at present for the destruction of such persistent pests as the San Jose scale, whilst, when properly handled, it has no injurious effect on the stock. The fumigating chambers may be made of any convenient size or material, the essential point being that it shall be capable of being closed absolutely air-tight, and provided with a flue-pipe in the roof, which can be opened or closed to allow of the escape of the gas after fumigation. The flue should be provided with a box containing caustic potash or soda to destroy the gas. The door of the chamber is provided with a shutter or sliding panel at the lower portion.

The trees having been placed on the floor of the fumigatorium, the cyanide of potassium, water, and sulphuric acid are brought together as explained above. At the end of an hour the shutters in the flue and in the door are opened, and the draught produced causes the gas to escape. After 10 to 15 minutes the door may be opened, but no one should be allowed into the chamber for another space of 10 minutes.

With ordinary care, no accident need be apprehended.

FUMIGATING GRANARIES.

The same method of ridding granaries, flour mills, and barns of weevils, moths, and other troublesome insect pests, without removing the grain stored in the buildings, can be carried out wherever the building can be made gas-tight. If the fumigation is done under the conditions already detailed, the seeds will retain their vitality almost unimpaired, if dry when subjected to the fumes.

STUDENTS FOR EXPERIMENTAL FARMS.

REGULATIONS *RE* ADMITTANCE OF STUDENTS TO EXPERIMENTAL FARMS.

The Hon. the Minister for Lands has been pleased to approve of the following regulations in connection with the admission of students at the Experimental Farms:—

1. That the minimum age of students for admission shall be 16 years.

2. That students shall be required to pay a fee of 10s. 6d. per quarter, and to provide themselves with such bed linen and towels as they may require.

3. The Government will find bed, mattresses, washing utensils, board, and room.

4. Students to make their own arrangements as to washing their clothes.

5. The teaching will be a practical course of agriculture, the use of various farm implements, sowing, reaping, etc., and students will be required to do physical work in all branches of farm labour.

6. Students whose work is not satisfactory may be dismissed at any time.

7. Agricultural books to be provided from which students can study.

8. Students will be required to obey the Manager, or any person put in charge of them by the Manager.

9. When any student is excused from work on the grounds of illness, he must not leave the farm grounds without the permission of the Manager.

10. Students must attend punctually at meals, and behave themselves in a quiet, gentlemanly manner.

11. All games are expressly forbidden during working hours.

12. Smoking in bedrooms or in any of the buildings is expressly prohibited.

13. Students may not bring, or cause to be brought, unto the farm any fermented or spirituous liquors. Any infringement of this rule will render the student liable to expulsion.

14. Students may not have firearms in their possession.

15. Each student must retain the room allotted to him.

16. Students will not be allowed leave of absence except under exceptional circumstances, and then only with the full consent of their parents or guardians in writing.

17. Students may at no time leave the farm without the permission of the Manager.

18. Each student must keep a journal of the work he does each day. These journals will be examined, and the marks awarded will count for the certificate of merit.

19. Students in charge of animals will be required to treat them in a kind and humane manner. Cruelty to animals will result in expulsion.

20. All cases of injury to animals or machinery must be reported to the Manager at once.

21. Students using tools and failing to return them to their proper place will be held responsible, and any student damaging implements, harness, gates, or other property on the farm through carelessness or neglect will be required to make good the same at his expense.

22. No student is allowed to bring or keep any animal on the farm.

23. Any student incapacitated by sickness and away from duty for more than two days must call in a medical man, and if such medical man certifies that the student is in a fit condition to be moved, he must go home to his parents or guardians, or some suitable place for the purpose of obtaining proper attention, unless special permission be obtained from the Manager. Although attention will be paid to sick students in case of sudden illness, it must be distinctly understood that the department does not bind itself in any way to provide nursing and medical comforts.

24. Complaints arising from any cause whatever are to be made to the Manager.

25. Any student who is guilty of profane, immoral, or insubordinate conduct, or who, after admonition, wilfully breaks any of the rules of the farm or persistently neglects his work may be dismissed by the Director of Agriculture.

26. On the recommendation of the manager, the Director of Agriculture may, at the close of any session, direct that any student whose retention is likely to be unprofitable to the student himself or injurious to other students, or prejudicial to the discipline or reputation of the institution, shall not be permitted to return.

27. Students may not enter the kitchen or private apartments of the manager, but must use only such rooms as are set apart for their use.

For further particulars and application for admission, address the Director of Agriculture.

ALEX. CRAWFORD,
Acting Director.

Parents and guardians will be required to fill up an application form, copies of which can be obtained from the Department of Agriculture.

Applicants will be required to produce satisfactory testimonials of character from either the last school teacher or employer, and will also be required to produce a doctor's certificate as to fitness for hard, manual work.

FORMS OF APPLICATION FOR ADMISSION AS A STUDENT ON A GOVERNMENT EXPERIMENTAL FARM.

For candidates under 21 years of age.

I hereby apply for the admission of my as a Student at the Experimental Farm, on the basis of the prospectus issued by the Minister for Lands showing the conditions under which students will be admitted thereto; and I undertake that he shall at all times conform to and obey the rules and regulations for the time being in force for the government and management of the said farm; and I agree that his continuance as a student at the farm shall be conditional upon his compliance with all such rules and regulations.

....

(Signature of parent or guardian.)

....

(Full signature of candidate.)

The parent or guardian of the candidate for admission as a student into the Experimental Farm is required to supply the following particulars:—

Candidate's age and date of last birthday.

Name of last school and date of leaving.

Previous occupation, if any.

Standard of education, indicating what educational certificates have been obtained, and the position attained in the last school.

.... (Signature.)

NOTE.—This form must be accompanied by a certificate of character from a responsible person, and a medical certificate as to health.

FORMS FOR APPLICATION FOR ADMISSION AS A STUDENT ON A GOVERNMENT EXPERIMENTAL FARM.

For candidates over 21 years of age.

I hereby apply for admission as a student at the Experimental Farm on the basis of the prospectus issued by the Minister for Lands, showing the conditions under which students will be admitted thereto; and I undertake at all times to conform to and obey the rules and regulations for the time being in force for the government and management of the said farm; and I agree that my continuance as a student at the said farm shall be conditional with my compliance with all such rules and regulations.

....

(Full signature of candidate.)

The candidate for admission as a student at the farm is required to supply the following particulars:—

Age and date of last birthday.

Name of last school and date of leaving.

Previous occupation, if any.

Standard of education, indicating what educational certificates have been obtained, and the position attained in the last school.

.... (Signature.)

NOTE.—This form must be accompanied by a certificate of character from a responsible person, and a medical certificate as to health.

BEE INSPECTOR'S REPORT.

By J. Sutton.

I have the honour to report having visited some of the goldfield centres, viz., Coolgardie, Kanowna, Boulder City, and Kalgoorlie. At the lectures given at these places I had much better attendance than was anticipated, and the interest taken in the industry was very marked, many and various questions being asked as to the possibilities of bee-keeping.

At Coolgardie, bees have been successfully kept ever since the visit of Mr. Alex. Crawford, some time ago. On some occasions assistance has been needed in the shape of a little feed, but the owner assured me that he had, during some seasons, procured 150lbs. from a single colony. This is really a good average, and goes to prove that only care and attention is needed to bring satisfactory results. The same remarks apply to a few apiaries at Boulder City, and at Piccadilly, Kalgoorlie. I was informed that bees had been seen in Kanowna, but could not get the name of the owner.

At the time of my visit, bee forage was apparent almost anywhere outside the towns. Several have suburban blocks cleared and under cultivation that look well. One patch of about an acre in extent, sown with oats, was about 18 inches high, and just coming into ear; looked very promising.

Now the water question has been solved, people are already taking advantage of the opportunity to beautify their homes with flowers, so that the conditions are very much changed, and that for the better.

Kanowna district appeared to me to be especially favoured in respect of natural flora. All bush scrub was blooming freely. Several who have had previous experience in bee-keeping were already preparing to take advantage, and make the best of present opportunities.

Considering the subject of cultivation is being taken up by so many, and interest taken in the pursuit of gardening, fruitgrowing, and other matters, a visit from the field officer would be much appreciated, and help to give the persons interested valuable assistance.

Hearty thanks were given at each place to the Director of Agriculture for the organising of the lectures, and great interest was taken in the many lantern slides exhibited.

BEE NOTES.

By J. SUTTON.

Before these Notes appear, swarming (at least in the Perth district) will be nearly over; that is, providing the weather settles and showers cease. Those so favoured should give close attention to young swarms, should showery weather continue, otherwise they need not be surprised to find trouble in the shape of chilled brood. To obviate any trouble, feed with thin, warm syrup, which will stimulate and keep brood-rearing going; thus, colonies will be considerably strengthened, and be in better condition to cope with the honey-flow when it arrives, after settled, sunny weather obtains.

To prevent swarming, plenty of room should be freely given, and queen cells removed. To do this colonies should be carefully gone through at least every nine days, and all queen cells destroyed. Care should be given not to give too much room in the brood-nest. Do not be in too big a hurry to spread the brood by giving extra frames; better to see that no more frames are given than there are bees to cover, lest a few fine days should start the queen to deposit eggs freely, and then a cold change may come stopping the honey-flow, which may bring disaster in the shape of spring dwindling.

Any trouble in this direction should be reported to the Department of Agriculture at once, when assistance and attention will be given to the matter.

Any person desiring the assistance or advice in any matter appertaining to apiaries, should apply to the Director of the Department of Agriculture.

REPORT ON THE NARROGIN EXPERIMENTAL FARM.

By PERCY G. WICKEN.

As requested, I hereby have the honour to hand in a report on the work done on the Narrogin Experimental Farm to 10th July, and attached are plans (1) showing the area and subdivisions of the same, and (2) showing the area under crop, and experiments. The improvements to date consist of (as numbered on plan):—

(1.) and (2.) Poultry yards.
(3.) Cart and tool-shed and 10,000 gallon tank.
(4.) Foreman's house.

(5.) Stables (60ft. x 44ft.), cow-stalls, barn and power windmill, chaffcutters, etc.

(6.) Squatter's tank (20,000 gallons), connected to well and paddock.

(7.) Rain-water tank, stone (40,000 gallons).

(8.) Hay-shed (60ft. x 38ft.).

(9.) Students' quarters and general meeting-room (40ft. x 20ft.), and 10,000 gallon tank (nearly completed).

(10.) Labourer's cottage for married man (four rooms), nearly completed.

(11.) Well (75ft.) and windmill, connected to squatter's tank on hill.

(12.) Labourer's cottage, single men, four rooms.

In addition to the above the improvements consist of 1,729 acres ringbarked. About 200 acres cleared ready for plough.

Fencing.—About $9\frac{1}{2}$ miles of boundary fence (jamwood posts, four wires, and $1\frac{1}{4}$ inch wire-netting). Two miles of cyclone fence for subdivision, and two miles of subdivision fence (seven wires and droppers).

The plant on the farm consists of 16ft. power aermotor, attached to shafting for driving chaffcutter, corncracker, saw-bench, grindstone, etc.; double-furrow plough, disc plough, seed drill, harrow, roller, two drays, spring cart, light squatter's wagon, harness, etc., and a good set of tools, to enable all kinds of work to be done on the farm.

Water has been one of our greatest troubles, and the cause of much expenditure, as we had to cart water for the greater part of the summer. Ample provision has now been made for the home paddocks, but we shall require more sinking in some of the farther-away paddocks to obtain water for stock.

We have at present a well (75ft.), which gives us a limited supply of stock-water, which is pumped up by a windmill into a 20,000-gallon squatter's tank, and laid on from there to the stables and the surrounding paddocks. I have also put down one 40,000-gallon stone tank and two 10,000-gallon concrete tanks for the roof water, and also galvanised tanks at each cottage. These will not be filled this winter, but will enable us to get a considerable quantity of water.

The poison bush has been grubbed on about 1,500 acres, which are now ready for stock.

Our crops consist of (as per plan) about 90 acres wheat, oats, barley, rye; and for experimental purposes a large number of manurial tests, and 30 varieties of wheat and oats, 16 varieties of grasses, and a large number of miscellaneous experiments; and we are at the present time sowing maize, potatoes, artichokes, beans, etc.

The stock consists of :—

250 sheep now lambing.
1 ram, Shropshire.
2 Ayrshire cows.
1 yearling bull, Ayrshire.
1 yearling heifer, Ayrshire.
2 calves, Ayrshire.
5 draught horses.
1 light horse, and a quantity of poultry.

The total expenditure to 10th July is as follows :—

	£	s.	d.
Fencing account	502	19	4
Building account	930	17	7
Clearing account	408	18	0
Ringbarking account	94	17	4
Crop account	84	12	6
Water conservation account	295	9	6
Poison grubbing account	44	14	0
Plant account	485	1	3
Labour account	249	12	1
Stock-feed account	57	16	6
Stock account	256	2	8
Total	£3,410	19	7

Total liabilities to meet works in hand for which money is available, £994 0s. 5d., making total authorisations to 10th July, £4,405.

The estimated expenditure for the coming year to provide for maintenance and for further clearing of land I estimate at £1,500; this amount will provide for the maintenance of students and purchase of further stock. There will only be a small income during this year, as we have not been able to get sufficient land cleared to grow a large area of crop above our own requirements for the year; but next year I hope the income will be considerably increased. I estimate we shall receive from the sale of chaff, wheat, wool, and mutton £300 during the year.

The valuations of farm and improvements I would put down as under.

As all the buildings have been erected and improvements made during the present year, I do not think we need make any deductions except for plant, and would, therefore, value the farm as follows :—

	£	s.	d.
1,000 acres of land at 10s. per acre	500	0	0
726 acres at 6s. 8d. per acre	242	0	0
Value of improvements	3,410	19	7
	4,152	19	7
Less depreciation on plant, say, £500 at 5 per cent.	25	0	0
	£4,127	19	7

During the year we received £29 8s. 9d. for the sale of meat and skins, and lost about 20 sheep through poison ; but as the sheep are now lambing this loss ought to be more than recouped.

All the buildings and initial works are now nearing completion, and during the coming year we shall be able to devote more of our time to farm work proper.

The students quarters are now nearing completion, and we shall, by the time this is published, be able to receive students for instruction in farm work under the conditions set down in the *Journal.*

THE PIG.

Bacon Curing.

The following article written by Mr. H. J. Colbourn, in *The Agricultural Gazette*, should prove of interest to our readers :—

"The leading points connected with pig rearing and fattening having been considered in the previous article, it now remains to describe the process of curing bacon. At the present time mild-cured bacon is what is most in demand in the markets, and this can only be satisfactorily prepared by injecting a properly prepared pickle into the tissues of the meat by means of an injection-pump. The particulars relating to this method are given below, and the illustration which appears shows the proper points at which the injections should be made. The method of bacon-curing pursued at the Hawkesbury College, N.S.W., has (for simplicity and effectiveness) much to recommend it. I am indebted for much of what follows to the valuable pamphlet on 'Pigs at the Hawkesbury College,' by Mr. G. Valder, published by the Department of Agriculture, N.S.W.

"In the first place, it is necessary that the pig be properly killed, and thorough bleeding is an important point to attend to. In severing the jugular vein to effect this, care must be taken not to bring the knife in contact with the heart, as the pig bleeds better if the heart is not interfered with.

"At the completion of the bleeding process, the pig is scalded at a temperature of from 175 degrees to 180 degrees F., in order to remove the hair from the skin. In a small way, one bucket of cold to three of boiling water is a safe thing.

"After the pig has been thoroughly cleaned, the hind legs are cut below the gambrel joint, so that both main cords may be reached, under which the gambrel should be inserted. The carcase is hung

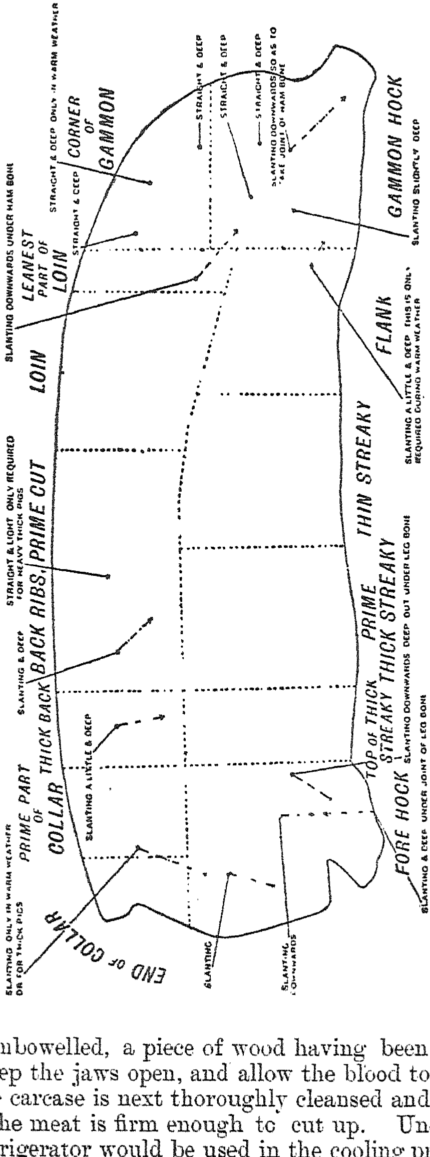

SLANTING ONLY IN WARM WEATHER OR FOR THICK PIGS
PRIME PART OF COLLAR
SLANTING & DEEP
THICK BACK
BACK RIBS,
STRAIGHT & LIGHT ONLY REQUIRED FOR HEAVY THICK PIGS
PRIME CUT
LOIN
SLANTING DOWNWARDS UNDER HAM BONE
LEANEST PART OF LOIN
STRAIGHT & DEEP ONLY IN WARM WEATHER
STRAIGHT & DEEP
CORNER OF GAMMON
END OF COLLAR
SLANTING A LITTLE & DEEP
SLANTING
SLANTING DOWNWARDS
STRAIGHT & DEEP
STRAIGHT & DEEP
STRAIGHT & DEEP
SLANTING DOWNWARDS SO AS TO TAKE JOINT OF HAM BONE
TOP OF THICK STREAKY
PRIME THICK STREAKY
THIN STREAKY
FLANK
GAMMON HOCK
FORE HOCK
SLANTING DOWNWARDS DEEP OUT UNDER LEG BONE
SLANTING & DEEP UNDER JOINT OF LEG BONE
SLANTING A LITTLE & DEEP THIS IS ONLY REQUIRED DURING WARM WEATHER
SLANTING SLIGHTLY DEEP

Diagram showing places where needle or pickle-pump should be inserted, in pumping a side of bacon, and the direction (shown by the arrows) in which the needle should be thrust

up and disembowelled, a piece of wood having been inserted in the mouth to keep the jaws open, and allow the blood to run out. The inside of the carcase is next thoroughly cleansed and hung in a cool place until the meat is firm enough to cut up. Under the factory system a refrigerator would be used in the cooling process, but such an expensive apparatus would be beyond the reach of most people.

"It is hardly necessary here to go into the details of cutting up, which could not be rendered intelligible from any written description.

"The process or curing is carried out as follows:—

"*Dry-curing.*—In dry-curing the bacon is rubbed daily for nine days. For the first day's rubbing, coarse salt, with a small quantity of saltpetre, is used. For five pigs, weighing from 130 to 140lbs., it takes about 50lbs. of good salt and 10 grains of saltpetre. For the other eight days, a mixture of equal parts of brown sugar and salt is used. On the first day the sides are rubbed until the salt commences to stick well, which is generally in about seven minutes. The first two days' rubbing are the most important, and, unless the meat cures then, it may be considered that it is in an unsuitable condition for curing. The salt and sugar mixture is used for imparting flavour as well as for curing. After the rubbing is finished the meat is stacked in a vat or tank, first putting a thin layer of salt on the bottom; a layer of sides is put on this, with the rind downwards; then another layer is crossed on this, and so on until all the bacon has been put in the tank. It is then turned every day for a week, the sides which are at the top to-day being at the bottom to-morrow, and so on. This allows the pickle which is made during the curing to be well distributed over all the sides. After the first week it is turned every other day for from two to three weeks, varying it according to the size of the pig. It is then ready for washing, drying, trimming, and smoking.

"*Stacking.*—Mark off part of the floor for stacking the bacon upon as it comes from the tanks. Cover the space with salt; then put a layer of bacon, covering it with a light coat of salt; then another layer of bacon, crosswise to the first, and so on, taking care to have layers level. For the first fortnight turn the stacks twice a week, and once a week for the other two or three weeks. The bacon can then be washed and smoked, or hung up in the green state until required.

"*Washing.*—After the bacon is cured, it is placed in water just warm enough to bear one's hands in, and is then brushed over with a dandy brush, which removes all fat, sugar, slime, etc., from the surface. It is then placed in a tank or vat, and covered with clean, cold water, in which it is allowed to remain for from 18 to 24 hours. This takes a lot of the salt out, and renders it mild-cured bacon.

"*Drying.*—The bacon is next hung up in a well-ventilated room to dry. If the weather is favourable, *i.e.*, if the days are fine and dry, with a slight breeze of wind during the greater part of the time, the bacon is generally sufficiently dry in from six to seven days.

"*Trimming and Polishing.*—In trimming the bacon the sharp points of the rib-bones are sawn off, and the remaining part of the fore-leg also sawn off level with the shoulder. The knife is then run over the belly-part of the rib-bones, and any loose pieces removed. The sweat-skin is scraped off with a sharp knife, and the side is then rubbed over with a little olive oil, which gives it a nice glossy appearance.

"*Smoking.*—The bacon is then placed in the smoke-house. At Hawkesbury, hardwood sawdust and damp corn-cobs are used to develop the smoke. In Tasmania, the dead and dried-up twigs and branches of the various species of eucalyptus are sometimes used, but these must be free from all trace of gum. From four to five days' smoking is given, care being taken not to smoke too much, as this greatly affects the flavour.

"*Brine-curing.*—Two pounds of good salt is dissolved in every gallon of water. This liquid is then strong enough to float an egg or a potato. To every gallon of the liquid the following is added:—4lbs. brown sugar, 2ozs. saltpetre, 2ozs. sal prunella, ½lb. allspice; and to every 50 gallons added 1lb. of ground peppercorns. The allspice is sown in a cotton bag, to prevent it from mixing with the pickle. The pickle is boiled for an hour, and is ready for use as soon as it is cold. This pickle can be kept in constant use if it is boiled every two months, and replenished with spice, sugar, etc. Boiling causes all blood, fat, etc., to rise to the surface, when such matters can easily be skimmed off. Pickle, properly looked after, becomes stronger and more valuable with age, and will last a long time. The pork must be cold, or it will not take the salt properly. The colder the flesh the easier it is to cure, and herein is the advantage of the refrigerator.

"Pump pickle into the shoulders and hams—from two to four injections in the shoulder, and two to three in the hams, according to their size.

"Three tanks or tubs are necessary. Have bacon tank No. 1 empty, cover bottom of tank with a thin layer of salt, then place a layer of bacon, taking care, should any of the sides overlie each other, to put a sprinkling of salt between. Sprinkle salt all over the pork, and also sprinkle very lightly with saltpetre; then pack another layer of bacon crossways upon the first, and so on until all the bacon is in the tank. When packing the tank keep every layer as nearly level as possible. Batten the meat firmly down, and cover the whole with pickle. If using new pickle, add 1lb. of brown sugar to every 10 sides, dissolving it in pickle before use.

"Miss one whole day before turning the bacon in No. 2 tank, viz., bacon put into No. 1 tank on Monday should be turned into No. 2 tank on Wednesday, and into No. 3 on Friday. The bacon will then be ready to take out of pickle on Monday, giving it seven days in tanks. Use saltpetre in No. 1 tank only. The after treatment to be observed is the same as in dry-curing."

POULTRY NOTES.

By Frank H. Robertson.

Among many poultry keepers there is a strong liking for breeding crossbred fowls in preference to going in for the pure article, the idea being that the best results are thus obtainable, whether for egg production pure and simple, or for a general purpose bird, that is to combine both good table qualities and a plentiful egg supply, or for table purposes only. Breeding first crosses is certainly very much better than breeding from a nondescript lot of birds showing no pure qualities at all, but when one considers the many difficulties that the breeder of first crosses has to contend with, and other disadvantages, it will as a general rule be found more profitable in every way to confine one's attention to breeding pure. In the first place, there are now such a large number of varieties of poultry to choose from, each one being particularly adopted for some definite quality, that the poultry raiser can have no difficulty in finding one which will suit his ideas both for profit and to please the eye, and without going to the trouble of selecting two breeds to produce the required result; for instance, suppose a good egg supply is wanted, and for that purpose Brown Leghorn and Minorca are mated together, the result would no doubt be a good layer, but to what extent would greatly depend on the laying qualities of the parent birds; if both of them are of indifferent laying strains, the mere fact of crossing two such birds by no means ensures an increase in productiveness; but if the parent birds are of good laying qualities, their progeny are also likely to be good layers, and satisfactory results are thus obtained. Now having got good laying pullets, the correct course to pursue would be, during succeeding years, to use male birds of one of the original variety, say, Brown Leghorn, thus in course of time the flock would be graded up to be nearly pure Leghorns, but this would be a slow process, and the birds themselves could only honestly be sold as cross-breds, or grades which means low prices. How very much better it would have been in the first instances to have bred from the Leghorns mated with a pure rooster; the egg result would probably have been the same, more likely better, if care had been exercised in always breeding from the best layers, and all along there would have been the sale of surplus stock raised, at prices much beyond what the mongrels would realise. Another objection to first cross-breeding is the fact that, unless expense is incurred in buying fresh stock every year, pure fowls will have to be bred to produce the fancied cross. Such being the case, how much simpler would it be to start with the pure, and keep to it all the time; if even only for the sake of appearances, a uniform colour is much to be preferred to the indefinitely marked plumage of the cross-bred.

A striking practical illustration of the motly appearance of cross-bred poultry was to be seen at the recent Bunbury Society's Show; there were on view two classes of first crosses represented by 18 birds. Taking the hen class of 14 as they come on the catalogue, viz.: *Game* and *Andalusian,* here we have a bird showing strong Malay type with mostly blue plumage; no doubt a good all-round fowl, but not equal to a pure Andalusian as a layer, nor to a Game for the table. All the all-round qualities could be obtained in any of the well-known general purpose varieties. Next, *White Leghorn* and *Buff Leghorn,* result, a white fowl slightly tinged with buff in hackle and breast, something like a bad specimen of a Pile. Then a cross, *Plymouth Rock* and *Wyandotte,* produce to all intents and purposes a rather small rose-comb Plymouth Rock. Next, *Plymouth Rock* and *Minorca,* a rather taller bird, Minorca in shape, lop comb, white lobe and legs, and barred plumage. Next *Dorking* and *Langshan,* producing a pure black fowl like an old type Orpington, with the Dorking five-toe. *Minorca* and *Spanish,* a white-faced Minorca; it is hard to see any object in such a cross, as both possess the same utility qualities. Next, *Indian Game* and *Silver Wyandotte,* produced a fowl almost identical in appearance to a Golden Wyandotte, well laced and marked, tighter in feather, and finer in general type than the pure Golden Wyandotte.

Leghorn and Andalusian.—A smudgy-looking bird of brownish appearance, with a slaty shade running through the plumage.

Leghorn and Minorca.—Bright, active looking fowl of black plumage, brown in hackle and back, slate-coloured shanks.

Leghorn and Orpington. — A bird of striking appearance, plumage a curious mottled mixture of white, black, and grey all over, white beak, dark shanks, general carriage that of a sprightly Orpington.

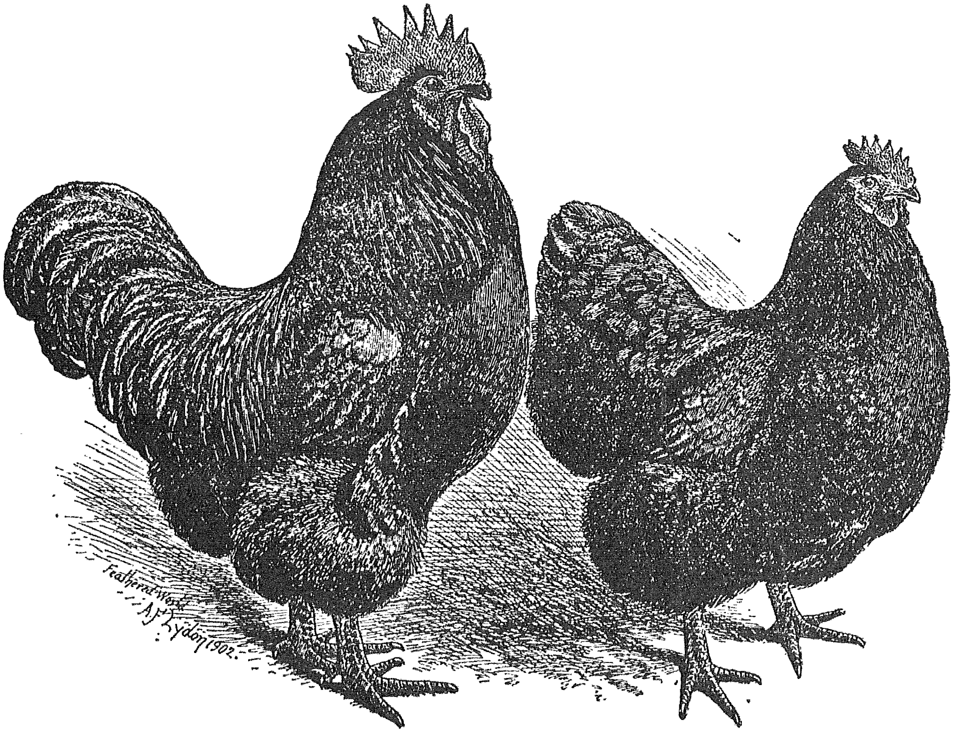
Hamburgh and Minorca.—Like a coarse Hamburgh.

Hamburgh and Andalusian.—A dull, blue bird, faint lacing, rose comb.

Leghorn and Wyandotte.—No doubt Silver Wyandotte and Brown Leghorn. A neat looking bird with rose comb, but very varied plumage, breast light brown with grey lacing, top colour grey, with faint partridge markings, dark hackle, yellow legs.

A motley-looking lot of fowls, taking them all round, and the furthering of poultry breeding is not advanced if such is persistently indulged in. The desired quality can be obtained in any of the well-known pure breeds. Therefore, by all means let every keeper of poultry adopt the pure article. Start with one breed only, stick to them without crossing, and run them for all they are worth.

Probably the fancy for cross-breeding is with the idea of producing greater robustness and stamina. Good constitutions will certainly be the result, provided the stock birds are sound and strong on both sides, but a sickly bird of one breed, if crossed with a strong bird of another breed is not likely to produce healthy



BLACK ORPINGTONS.

chickens. To breed strong, healthy fowls, the parent birds must be healthy on both sides, whether in breeding mongrels or pure. Pure poultry are quite as good and strong as common if properly kept; but unfortunately some persons who sell pure fowls and eggs spoil the stamina of their stock by keeping them in runs that are too small. Such persons sometimes are large and successful exhibitors at shows. The novice would-be buyer naturally thinks that the man who wins a large number of prizes is a good person to go to for fowls or eggs. Such, however, is by no means a reliable criterion. Before buying, always see how the stock is kept. It does not require an expert to settle that question.

ORPINGTONS.

The accompanying illustration depicts the single-comb Black Orpington, one of the best all-round general purposes fowls. They are of comparatively recent production, having been made by Mr. Cook, of Orpington, England, by first crossing Black Plymouth Rock hens with Black Minorca cock, the progeny being then mated with a clean-legged Langshan cock, and by selection and breeding from the shortest legged birds this new breed was definitely fixed. A few years ago they were to all intents and purposes clean-legged Langshans, but the craze for length of limb in the Langshan, and the gradual reduction in length of shank in the Orpington, soon made the difference between the two breeds apparent to the most casual observer. The present-day type of show Langshan is a very tall, close-feathered bird; while the Orpington is a very short legged blocky fowl, comb rather small and evenly serated, face, ear lobes, and wattles all bright red, eye dark brown, or black preferred, shanks black, skin and flesh white, plumage all black, with a bright green sheen, free from purple; weights of fully-developed good specimens are—cock, between 9 and 10lbs.; hen, 7 to 8lbs.

There is another variety of the Black Orpington, with a rose comb; they possess all the useful qualities of the other variety, but are not of great popularity.

Within the past 10 years Mr. Cook has introduced another variety, viz., the Buff Orpington. They are said to have been produced by mating a Golden Spangled Hamburgh cock with coloured Dorking hens, the progeny from this cross then mated to a Buff Cochin cock; the egg-producing qualities are obtained from the Hamburgh blood, the white flesh and good table properties from the Dorking, and the colour of plumage from the Buff Cochin. A good all-round bird is thus produced, and one which is said to be rather a better variety than the black. Since the advent of this breed they have taken on wonderfully well, and are now very popular all over the world; being a new breed, they are subject to several faults which will take a few years to breed out, such as black and white feathers in the tail and flights, yellow legs, and feathering on the legs. In producing a typical specimen, it is necessary to have a good, cobby shape, as in the black, and the plumage of an even shade of buff all over; but, of course, for general utility purposes, it does not matter about defects in show points in this or any other breed, so long as the fowls are well endowed with the qualitities the breed excels in; it would be foolish to eject a good bird from the breeding pen just because it is deficient in some fancy show points. As a good, all-round breed, the Orpington, whether buff or black, is an ideal farmer's fowl, being both good layers and good on the table, and good brooders.

Poultry Statistics.

Some interesting statistics are to hand showing the progress of the poultry industry of Western Australia for 1896 to 1901, as follows:—

Number of poultry kept on 31st December for the following years.

Year.	Fowls.	Ducks.	Geese.	Turkeys.
1896	181,430	16,821	2,099	3,562
1897	230,843	23,305	2,225	3,619
1898	257,018	32,221	2,421	4,723
1899	304,794	36,724	2,523	6,216
1900	319,383	41,112	3,441	9,071
1901	318,816	39,552	3,586	11,778

Thus making on 31st December, 1901, a grand total of 373,722 head of fowls, ducks, geese, and turkeys in the State on that date, which taken at an all round valuation of 3s. per head gives a value of £56,058. It would be hard to estimate the value of the egg crop, but it would doubtless be worth considerably more than the live stock value, which if put down at £75,000 would give a total of £131,000 odd, which, large as it may appear, is far below actual requirements. The above figures show a general all round increase in the number of poultry bred, but it is by no means keeping pace with the demand, as the egg importations are increasing in value at the rate of about £10,000 a year. The poultry raising industry will have to be at least doubled to come anywhere near requirements, as the egg importations are now over £71,000 in annual value.

The Eastern Province, comprising the districts of Beverley, Moore, Northam, Swan, Toodyay, and York, is the largest producer of poultry, with a total of 121,356. The South-West Province comes next with not much more than half that number, viz., the districts of Bunbury, Murray, Nelson, South-West Mining, Sussex, and Wellington.

The Best Breed.

Which is the best breed of poultry?—is not an unfrequent question that is asked by the embryo poultry keeper, and is one which at once leads into a small lecturette by way of explanation as to the qualities of the various varieties. Briefly stated there is no best breed, such is in many instances a matter of opinion or fancy.

In the first place success in poultry keeping is a matter of interest, the same occurs in any calling or occupation of life, without a keen delight, or concentration of the mental faculties, it is impossible to attain anything beyond mediocrity, therefore if one starts with a kind of fowls for which there is no liking and there is a strong preference for some other breed, what else but failure can be expected if the former is retained. Keep the breed that one likes best, and the best results are likely to follow.

THE CROP OUTLOOK.

A WORD OF WARNING.

By the ACTING DIRECTOR.

Taking the agricultural districts as a whole, the prospects of the coming harvest are decidedly bright, and it is probable that we will have a record cereal yield this year. In some places in the South there has been rather too much rain, and the crops on the low-lying and clay lands have suffered considerably, but with fair weather may yet recover. In other places the growth has been so rapid that the straw is weak. Some of the crops have been knocked down with the wind and rain. In the Central Eastern District the crops are strong and healthy, and give promise of an excellent return. Further East the growth in many places has been unusually rapid, and much is now being cut for hay, the earliest cutting taking place on the 1st September.

From the Eastern States, on all hands, come reports of the particulars of a record crop, and the price anticipated for wheat when the new crop comes in is, according to some of the large buyers, about 2s. 6d. per bushel, and about £3 for prime hay.

The prices in this State are ruled to a very great extent by the prices in the Eastern States, so we may anticipate low prices here. So far as wheat is concerned, if the price quoted is correct for the East, we cannot expect our sales to be more than from 3s. to 3s. 6d. per bushel. As for hay, the price depends to a great extent upon how much crop our farmers cut for hay this season. Last year there was considerably more cut than was necessary to meet our requirements, and there is still a considerable quantity on hand throughout the country. If we cut the same quantity this season again there is no doubt but there will be more or less of a glut and prices will go very low, probably under £3 per ton. If less is cut the price may keep up to £3 10s. or £4. Farmers should carefully consider the position before deciding to cut heavily for hay.

A DESTRUCTIVE INSECT.

The following notice of the introduction of a supposed beneficial insect is taken from the columns of the *Adelaide Observer*:—

"A short time since a parcel containing coccids destructive of nut grass was received by a local grower from Mr. Walter Froggart, the New South Wales Government Entomologist. A fear lest the insect might prove destructive of maize and other fodder roots led to the parcel being kept unopened by the recipient. Communications from Mr. C. French (Victorian Entomologist) and Mr. Walter Campbell (New South Wales Director of Agriculture), have been reassuring on this score, Mr. Campbell stating that the insect has been found living among maize, lucerne, oats, and grass crops, but that it has not been found to attack any other roots than those of the nut grass. This is good news to such of our growers as have been troubled by this most noxious weed."

With reference to this, the following article which appeared in the *Queensland Agricultural Journal* should be read with interest:—

ENTOMOLOGY.

Nut Grass Destroying Insect.

"Early in May of the present year it was brought under the notice of the Department of Agriculture that in the Singleton district of New South Wales that notorious weed, nut grass, was dying through the attacks of an insect parasite. Subsequently the same incident was referred to in the local Press, the particular insect concerned being denominated a 'coccid' of the 'free moving class.' At the same time it was stated that nut grass plants on which the insects occurred were being disseminated, in order to secure its establishment and consequent co-operation in exterminating the weed named in localities remote from that in which the so-called 'coccid' had been discovered. More recently parcels of such plants have not only been placed under offer on certain terms to residents of different agricultural districts in Queensland, but have also in some cases been already despatched to them; and this by or under the auspices of the Department of Agriculture of New South Wales.

"The Queensland Government Entomologist had, however, anticipated the arrival of such consignments, and had taken steps in accordance with the provisions of 'The Diseases in Plants Act of 1896' to intercept them, it being in his opinion essential to ascertain, before admission, not only the generic and specific identity of the insect, but also the degree of probability of its attacking other plants than the one for whose destruction its introduction was being aimed at. Opportunity has thus been afforded him for examining examples of the insect in question, and it has been found that they present in every detail the structural features assigned to a European insect named *Antonina purpurea*, agreeing in every particular with the description of this published by the great French specialist, V. Signoret.

"However, the identity between the European and Australian insects cannot be positively established until examples of both have been secured and most carefully compared—a work that will necessarily occupy some little time. Meanwhile it has been officially announced in New South Wales that the Singleton insect has been, so far, found to be exclusively associated with nut grass; but since—as Mr. Tyron points out—no young are produced during the winter season, and it can alone spontaneously migrate from its host plant as a larva, such freedom of occurrence on plants recently established in its vicinity may for the time being be expected. But should the identity of the European and the Australian insect be found to obtain—as seems most probable—it may with reason be anticipated that the exclusive attention of the latter to nut grass will not hereafter characterise its habits, since the former insect—*Antonina purpurea*—is a coccid that in its native home is injurious to several members of the great family of grasses—one that includes plants whose cultivation constitutes one of our most important primary industries.

"Until, therefore, the question raised has been definitely disposed of, it would be most injudicious to establish this nut grass-destroying insect in our State, and agriculturists are advised to forbear meanwhile from taking any steps that would tend to accomplish this result."

We cannot refrain from sounding a note of warning to those enthusiasts against the indiscriminate introduction of insects which might prove of far greater harm than good. Advice should at all times be first obtained from the Government Entomologist before venturing on such an hazardous matter.

FOR SALE.

PURE BRED JERSEY BULL.

The Director of Agriculture desires to notify that the Government has a young pure bred pedigreed Jersey Bull, from a good butter strain stock, for sale.

Particulars, etc., may be obtained by writing to the Director of Agriculture, Perth.

ANGORA GOAT BREEDING.

Queensland is taking the lead among all the Australian States in the establishment of flocks of Angora goats, and excellent reports are being submitted as to the profitable character of this class of stock raising upon classes of land that are so poor and scrub covered as to have been hitherto unused.

"The Angora," says Mr. W. R. Robinson, of Toowoomba, in a paper read before an agricultural conference on this subject, "is well suited to a large area of country now practically lying waste. I refer to country on the main range—undergrowth land, semi-scrub country, and land unsuited for either sheep or cattle, and a class of country that can be obtained for very small capital. One or two breeders on the Darling Downs introduced a few Angoras some years ago, but at that time little was known about them, and the open Downs plains were not suited to their habits or to the production of good mohair. There is abundance of land, however, well suited for raising Angoras, and there is no reason why the mohair industry should not be developed here, as in South Africa and elsewhere. Mohair and goat skins have a world's market, and are as marketable as all other farm productions; there is a growing demand for them, and they can be sold either locally or in the home markets. The outlay in starting a small flock is not very great. Angoras are hardy, prolific, and by judicious crossing and grading a pure flock can soon be built up.

"The only part of the Angora that is not at present in actual demand in large quantities is the flesh, not because the meat is not nutritious or delicious, especially when young, but simply because it has not yet found its way wholesale into the meat markets. A plentiful supply of meat should popularise it, and bring it into general use. Even if this were not so, the raising of Angora goats for mohair and skins should be sufficiently profitable where conditions are peculiarly favourable in the Commonwealth. The 'gamey' flavour of the meat is due to the goat being more a browser than a grazer, and it is that characteristic that recommends the Angora goat for country not specially adapted for sheep, cattle, or horses.

"In raising a flock, if funds permit, of course it is best to start with pure stock on both sides. The progeny is then valuable, and the mohair of the best quality. If, however, funds are limited, the best method is to obtain a pure buck from some reliable breeder, and cross him with common, pure white nannies, which are fairly plentiful and can be bought at moderate prices. Select those showing fine heads and horns, and smooth, silky skins; avoid all nannies showing long, coarse hair. Cull heavily the first year; only retain the weaner does showing most of the Angora type. On these use another pure Angora buck, and so on until the fourth cross. You then have a first-class goat, which will produce first-class mohair, yielding an average quality fleece of from 4lb. to 6lb., the better animals yielding up to 8lb. They are hardy, easily managed, and will live where a sheep or bullock will starve; they are free from disease, will live on poorer country, and are less trouble than sheep. They should be shorn in the early Spring; if left later the hair loses lustre, life, and weight. The export of mohair from the Cape in 1899 amounted in value to £640,000, the average price per lb. being 1s. 4d. to 1s. 7d.

"Country suitable to goats takes three acres or even more to carry a sheep, which, at the outside, would only yield, say, 6lbs. of wool, at 8d.—4s. Three goats on the same country would yield 5lb. of hair each, at, say, 1s. per lb., or equal to 15s., and with far less trouble in management. The term of an Angora's life is about eight to 10 years, but it matures at from 18 months to two years, at which period the does are fit to breed. Kids and weaners produce the finest quality of hair, and the wethers produce heavier fleeces than the does.

"The possibilities of this important industry are immense and worthy of serious consideration; and I think our Agricultural department would do well to start a small pure-bred flock, so that intending purchasers could obtain their stock from a reliabe source. There are practically millions of acres of poor, rough land that under this industry would prove a valuable asset to the State. The demand for Angoras is rapidly increasing, and information regarding them is being anxiously sought after. Only during the past few weeks I have had several letters from settlers who are thinking of going into the industry. I have been in communication with some of the leading breeders, and find bucks can be purchased at from £3 3s. to £5 5s. each; so if any one present wishes to start a flock I shall be pleased to give him the address of a good and reliable breeder.

"In considering Angora keeping, it is of more importance to study the climate with reference to moisture rather than temperature. Therefore, low lands with much moisture and high temperature are not recommended. So far as temperature is concerned, no place has been found that is too hot or too cold for Angoras, for although not partial to heat they will stand it quite as well as sheep. The climate in Angora, Asia Minor, where the breed originated, and is still supposed to flourish in its more perfect state, is extreme; 85 deg. Fahr. are registered in summer, and as low as zero Fahr. in the winter. At the Cape, where they are thriving well, the temperature goes higher in summer, but not so low in winter. The United States presents a wider range. Australia, therefore, as far as temperature is concerned, should be everything that can be desired.

"While the sale of skins and mohair provides direct cash returns, the land on which Angoras are depastured can be permanently cleared of undergrowth at a cash profit instead of having to employ labour to do the work, which is not as effectually cleared as by the goats. The improvement of second class country through the agency of goats will no doubt be an inducement with many to embark in the business. The Angora being essentially a browser will stand more hardship in time of drought than any other animal. It is a well known fact that through the last trying drought the flocks of common goats looked wonderfully well and bright, although there was not a vestige of grass to be seen. I feel confident that the mohair industry here must in the near future be a profitable one. We have the country and climate suited for its development. There is money in it."—*Exchange.*

PREVENTION OF POTATO DISEASE.

We are indebted to Professor Winter of the University College, N. Wales, for his report on the prevention of potato disease, which we have taken from an English exchange. From this we learn that, as the result of experiments, in the majority of cases the operation has been attended with success. In addition to checking the disease, spraying in a great many cases increases the crop. Experience has shown that in order to secure the best results the potatoes should be sprayed before the disease appears, and in some cases they are sprayed again in about three weeks. The preparation most frequently in use is known as the Bordeaux mixture, and consists of—

20lbs. of sulphate of copper.
10lbs. of lime.
100 gallons of water.

The mixture is applied at the rate of 100 to 150 gallons per acre. There are several preparations similar in their main features to the Bordeaux mixture, which can be obtained mixed ready for use. One of these, named "Strawsonite," was used in these experiments both in 1901 and 1902. It was applied at the rate of 100 gallons per acre. In applying the dressing, which should be kept well stirred, care should be taken to cover the surface of the leaves, more particularly on the under side. The success of the treatment depends upon the time it is carried out, upon the weather, and upon the care with which the work is done. The dressing should be repeated if it is washed off by rain.

A noticeable feature of the experiment in each year was the fact that the plants on the sprayed plots remained green fully 10 days longer than those on the unsprayed plots. The plots were one-twentieth of an acre in size, and the dressings were applied about the middle of July. The tables show that in both years the total weight of potatoes on the sprayed plots was, with the exception of Bryn, considerably greater than on the unsprayed.

The average weight of marketable potatoes at all the centres for the two years was as follows :—

MARKETABLE POTATOES.

	1902.			1901.		
	t.	c.	lbs.	t.	c.	lbs.
Average weight per acre (sprayed) ...	9	2	76	11	4	0
Average weight per acre (unsprayed)	7	8	104	10	3	24
Average increase per acre on the sprayed over the unsprayed plots	1	13	84	1	8	88

It will be seen that in both years there was a very substantial increase of marketable potatoes on the sprayed plots; and it is worthy of note that this increase occurred at every centre at which the experiment was carried out. It was observed at some of the centres that the marketable potatoes were somewhat larger and more even in size than those from the unsprayed ground. It is quite evident, therefore, that the spraying had a stimulating effect on the growth, as the sprayed portions kept on growing for a longer period and produced tubers of superior quality.

The following figures afford further proof of this, as they show that there was a larger quantity of small potatoes on the unsprayed plots :—

SMALL POTATOES.

	1902.			1901.		
	t.	c.	lbs.	t.	c.	lbs.
Average weight per acre (sprayed) ...	0	12	96	1	7	28
Average weight per acre (unsprayed)...	0	17	36	1	11	79
Average increase per acre on the unsprayed over the sprayed plots ...	0	4	52	0	4	51

The next table shows that the dressing was not very effective in preventing disease in either year. It did, however, succeed in checking it to a considerable extent, and it may be noted that there was a less weight of diseased potatoes on the sprayed plots at all the centres.

DISEASED POTATOES.

	1902.			1901.		
	t.	c.	lbs.	t.	c.	lbs.
Average weight per acre (sprayed) ...	1	0	100	8	13	5
Average weight per acre (unsprayed)...	1	3	104	0	15	43
Average increase per acre on the unsprayed over the sprayed plots ...	0	3	4	0	2	38

It is evident that the effects of the spraying have been :—

(1.) To produce a large increase of marketable potatoes.

(2.) To reduce the percentage of small potatoes.

(3.) To check the disease to a certain extent.

MANURING.

Mr. H. J. Colbourn, writing in the *Agricultural Gazette* on Compost Heaps, says:—

"The presence near the homestead of carefully prepared compost heaps is one of the best evidences of thrifty and economical farming. By their means large quantities of rubbish and waste material can be converted into valuable manure, and where little farmyard dung is produced, compost heaps acquire additional importance in the system of farming practised. Their efficacy depends upon the material at command to make them, and also very largely upon careful management, and a study of the requirements of the soil to which they are to be applied. The object to be held in view in making a compost heap is the decomposition of the substances used in its formation, in order that they may become available for plant nutrition when applied to the land. A mixture of animal substances with earth makes the most powerful kind of compost; and in making heaps of this kind, it was at one time customary to place the animal remains such as fish refuse, flesh, etc., in alternating layers, a method which, however, conduces to waste. A better plan is to dig a hole in some convenient situation, and cover its concave bottom with four or five inches of strong clay, upon which spread a stratum of stones, or shingle, and beat it well in. Into this pit should be carted soil of a kind likely to benefit the land to which the compost is to be applied. That is, if the land to be manured is heavy, light soil should be taken to the compost heap; or, if light, then clay or strong loam should be made use of. All weeds about the farm should be cut down before the period of seed-production, and these, together with all succulent plants growing in ditches and watercourses, together with dead leaves or other available material of this kind, should be carted to the pit, ready to mix with material of stronger fertilising power. The latter may be offal, dead fish, bones, refuse, fodder, sawdust, etc., which, after being (when in lumps) thoroughly broken up, may be placed in heaps about the pit, to be gradually thrown in, and mixed with the soil and other refuse material. The compost heap will thus soon be raised to the requisite height, and if all the ingredients have been thoroughly mixed, fermentation will speedily set up, and in a couple of months the compost will be ready to put on the land. The decay of the heap and the complete incorporation of its constituents will be accelerated if lime is mixed with the material as it is put together. The lime will greatly increase the fertilising properties of the compost, but it should only be brought into contact with fresh material, which has not already undergone decomposition; otherwise, waste and injury may result.

"A compost heap of this kind need only be turned once, as frequent turnings are liable to injure rather than benefit. If, however, fermentation subsides too rapidly, holes may be made in the heap with poles; these being thrust from the top nearly to the bottom. Into these holes urine or the fluid drainage of the farmyard may be poured, in order that the mass may be permeated by the liquid and fermentation be carried to its completion. If a compost may be supposed from the material which has been used in its formation to contain the seeds of weeds of any kind, it is best to apply it to pasture rather than to arable land; for although the process of fermentation and decay which the heap undergoes may, if it is very thorough, destroy the vitality of any seeds contained in it; nevertheless, one must not trust to this, nor venture to apply such a manure where, if the weeds afterwards grew, they might do harm, which they would be more likely to do upon arable than upon pasture land. Risk of disseminating weeds should in any case be avoided, and this can be done by cutting all weeds from the compost heap, as before indicated, at about the time of flowering. Arthur Young strongly recommended the application of a compost, formed upon the above lines, to worn out pastures. His method to improve land of this kind was to put a fine coultered cutting plough or scarifier through it. This cuts the surface in slips or incisions four or five inches asunder, but does not raise or turn them. This cutting of the grass roots is very beneficial, and, if the compost is applied at the same time, it sinks into the incisions made by the coulters, and causes a great improvement in the quality of the herbage, as well as increasing the amount of produce. It may be noted that cutting the ground first, and then laying on the manure, makes a greater improvement than manuring first and then cutting; and both are superior to manuring and not cutting.

"It does not matter how diverse the materials may be which are brought together to form a compost heap, so that they will chemically harmonise, and not nullify or dissipate one another; animal, vegetable, and mineral substances may be united to lend their aid in fertilising the soil; and the more various the matters, the more rapid and perfect will be the decomposition. The compost heap should be so formed that the rain will run off it, otherwise its most valuable constituents may be washed away. All manures formed from putrescible substances should, when put upon the land, be promptly covered with soil, otherwise the sun and air will do them injury. Sawdust, especially, if it has been charred by fire, is of great value in forming compost heaps, both on account of its absorbent nature, and from the chemical ingredients which it contains. Ashes also must not be forgotten, since they are of great value as a source of potash; also, in the absence of lime, they tend to promote the formation of nitre in the compost, and this is, perhaps, the most valuable of all forms of plant food. Indeed, the artificial production of nitre is brought about by making heaps of ashes and animal refuse in such a manner that the nitre can be washed out when it has had time to form in sufficient quantity. A compost heap should never be kept long on hand before being put upon the land, otherwise loss of fertilising material is sure to occur."

DALGETY'S REPORT.

Messrs. Dalgety & Co., Limited, Grain Brokers, report as follows in connection with their Perth, Fremantle, and Kalgoorlie markets, for the week ending 14th August:—

Chaff.—Prices opened on a par with closing rates of the previous week, and the demand generally was brisk until Thursday when supplies showed a sudden increase, with the natural result that values declined in some cases fully 12s. 6d. to 15s. per ton. Towards the end of the week the bidding was very irregular, but generally most lots were fairly well competed for at ruling rates.

We sold the following trucks of Chaff:—

AT PERTH.

Truck No.		Per ton.		
		£	s.	d.
5298,	ex East Northam—Wheaten, slightly damaged	5	17	6
1981,	ex Brookton—Medium wheaten	6	10	0
5195,	ex Brookton—Medium wheaten	6	17	6
5308,	ex Benger—Discoloured oaten	3	12	6
5447,	ex East Northam—Prime green wheaten	7	10	0
5496,	ex East Northam—Prime green wheaten	7	2	6
4422,	ex Brookton—Prime wheaten, slightly mixed	6	15	0
893,	ex Wagin—Oaten straw	3	15	0
2677,	ex Wagin—Medium wheaten	6	5	0
3316,	ex York—Medium wheaten	6	10	0
5191,	ex Gilgering—Medium wheaten	6	0	0
5516,	ex Gilgering—Medium wheaten, badly cut	5	15	0
4420,	ex Gilgering—Medium wheaten, badly cut	5	15	0
6185,	ex Pingelly—Prime green wheaten	6	17	6
895,	ex York—Prime wheaten	6	12	6
3685,	ex Broome Hill—Prime oaten	5	5	0
2504,	ex Wagin—Prime green wheaten	6	17	6
3799,	ex Wagin—Wheaten, slightly musty	5	10	0
455,	ex Benger—Inferior oaten	3	12	6
5358,	ex Beverley, Prime green oaten	6	2	6
5440,	ex East Northam—Inferior oaten	3	10	0
4547,	ex Wagin—Prime green wheaten	6	15	0
4196,	ex East Northam—Prime green wheaten	7	0	0
1135,	ex East Northam—Prime green wheaten	7	0	0

AT FREMANTLE.

At this centre the position was somewhat reversed, supplies coming forward very slowly, the consequence being that values ruled much higher than at Perth, in fact, at the latter end of the week, prices were fully 10s. in excess of Perth rates.

We sold the following trucks of chaff:—

Truck No.		Per ton.		
		£	s.	d.
2648,	ex Newcastle—Dry oaten	5	0	0
3821,	ex East Northam—Prime green wheaten	7	12	6
5534,	ex Gilgering—Medium wheaten	6	5	0

Also six trucks of medium wheaten, ex our store, at prices ranging from £7 to £7 5s. per ton.

Pressed Straw.—Enquiry good. Very little offering.

Oats (Algerian).—As far as locals are concerned, business is very limited, very few being available; good lines heavy milling imported, selling from 3s. 10d. to 4s., whilst other grades range correspondingly.

Barley.—No local offering. Imported "Chevalier" 4s. 9d. per bushel.

Hay.—Business restricted, the demand being limited. We sold 100 tons of prime wheaten hay at satisfactory rates; also 15 tons of prime oaten hay, suitable for racehorse feed.

Wheat.—Competition for local wheat on the city markets is very restricted, owing to the heavy supplies now landing ex ship "Penthesilea" from America, consigned to various city importers. During the week we sold one truck of prime local wheat at 5s. 7d. per bushel. There is little demand on the city markets for prime local milling wheat.

AT KALGOORLIE.

Chaff.—Values at this centre during the past week are somewhat ahead of the coastal markets, supplies to the goldfields not having come forward quite so freely, as during the preceding week. We sold:—

Prime wheaten chaff at prices ranging from ...	£8 10s. to £8 15s.
Prime oaten chaff at prices ranging from ...	£8 10s. to £8 15s.
Inferior wheaten at prices ranging from ...	£7 7s. to £7 10s.
Mixed oaten and wheaten at prices ranging from	£7 to £7 10s.

We sold a small parcel of prime oaten hay at £8 15s. per ton.

Pressed Straw.—We have had good enquiry, but have experienced great difficulty in fulfilling orders.

Hides, Skins, etc.

Messrs. Dalgety & Co., Ltd., report having held their usual weekly sale on Friday, 14th August, when a representative catalogue was submitted. Keen competition ruled for sheepskins and pelts, but a further fall in values must be quoted for hides and tallow. Fur skins showed no alteration from late quotations. Prices:—

Sheepskins—

Merino super., 6¾d. to 7¼d. per lb. ... Crossbred super., 7d. to 7¼d. per lb.
,, medium 6d. to 6½d. per lb. ... ,, fine, 6½d. to 7d. per lb.
,, inferior, 5¼d. to 6d. per lb. ... ,, medium, 6d. to 6½d. per lb.
,, pelts, 4½d. to 5½d. per lb. ... ,, coarse, 5d. to 5¼d. per lb.
Crossbred pelts, 4d. to 4½d. per lb.

In all classes where pelts are sun-dried, weevil-eaten, cut, torn, or perished, values are 1d. to 1½d. below quotations.

Hides—

Prime stout and heavy, 5½d. to 6d. lb. ... Prime light, 4½d. to 4¾d. per lb.
,, heavy, 5d. to 5½d. per lb. ... Medium light, 4¼d. to 4½d. per lb.
Medium heavy, 4½d. to 4¾d. per lb. ... Extra light, 4d. to 4¼d. per lb.

Attention to flaying and preparation for market is very necessary, as all damaged lots rule from ½d. to 1d. per lb. below quotations.

Kangaroo Skins—

Grey fresh, ½lb., 1s. 6d. to 1s. 8d. per lb. ... Red fresh, ½lb., 1s. 2d. to 1s. 5d. per lb.
,, ¾lb. to 1½lb., 2s. to 2s. 4d. lb. ,, ¾ to 1½lbs. 1s. 9d. to 2s. lb.
,, 2lbs., 1s. 7d. to 1s. 10d. lb. ,, 2lbs., 1s. 4d. to 1s. 8d. lb.
Perished lots, 1s. to 1s. 6d. per lb.

Opossum Skins—

1st black, 25s. to 28s. per doz. ... Ordinary greys and red mixed,
2nd „ 12s. to 16s. per doz. ... 7s. 3d. to 7s. 9d. per doz., average.

Tallow—

Prime mixed, 24s. to 25s. per cwt.; medium mixed, 22s. to 23s. per cwt.; inferior mixed, 20s. to 22s. per cwt.

Messrs. Dalgety & Co., Ltd., Grain Brokers, report as follows in connection with their Perth and Fremantle markets for the week ending 21st August:—

Chaff.—Prices opened on a par with closing rates of the previous week, but as the week progressed the demand brightened, and was more regular, closing rates showing an improvement of fully 7s. 6d. per ton. Supplies were very limited, and the general condition of the market was firm.

We sold the following chaff:—

AT PERTH.

Truck No.		Per ton. £	s.	d.
1099,	ex Wagin—Good wheaten	6	5	0
2548,	ex East Northam—Prime wheaten	6	17	6
3846,	ex East Northam—Medium oaten	4	12	6
5963,	ex East Northam—Wheaten	5	17	6
307,	ex East Northam—Prime green wheaten	7	0	0
3387,	ex York—Good wheaten	6	5	0
4339,	ex Katanning—Wheaten straw	3	0	0
5515,	ex Wagin—Prime wheaten	6	15	0
2390,	ex East Northam--Good wheaten	6	2	6
1329,	ex Newcastle—Damaged oaten	4	0	0
4409,	ex Mt. Kokeby—Medium wheaten	6	10	0
5522,	ex Mt. Kokeby—Medium wheaten	6	10	0
2932,	ex Moojebing—Wheaten straw	3	0	0
3295,	ex York—Good wheaten	6	12	6

AT FREMANTLE.

Truck No.		£	s.	d.
1529,	ex Katanning—Wheaten straw	3	2	6
2036,	ex Perth—Inferior wheaten	3	10	0
1121,	ex Perth—Prime wheaten	7	5	0
2576,	ex Perth—Medium wheaten	6	12	6
4030,	ex Perth—Medium wheaten	6	10	0
6162,	ex Gilgering—Dry wheaten	5	7	6
5353,	ex York—Prime green wheaten	7	12	6
1108,	ex Kellerberrin—Good wheaten	6	5	0
1976,	ex Kellerberrin—Good wheaten	6	2	6
323,	ex York—Oaten	6	10	0
78,	ex Greenhills—Prime wheaten	7	5	0
6140,	ex Greenhills—Prime wheaten	7	5	0
520,	ex Perth—Medium wheaten	6	0	0
5520,	ex Perth--Medium wheaten	6	0	0
6110,	ex East Northam—Good wheaten	6	15	0
2678,	ex Greenhills—Prime wheaten	7	0	0
154,	ex Perth—Wheaten	5	10	0
3433,	ex Perth—Wheaten	5	10	0
1152,	ex Pingelly—Prime oaten	7	5	0

Pressed Straw.—Enquiry good. Very little offering.

Algerian Oats.—Very few locals offering, most of the lines available being imported. Heavy milling sold from 3s. 10d. to 4s., whilst lighter lines have been quitted at from 3s. 6d. to 3s. 9d.

Barley.—No local offering. Imported "Chevalier" 5s. per bushel.

Hay.—With a limited demand, there has been very little business done in this line. During the week we sold three parcels of wheaten and oaten hay at satisfactory rates. Nominal value of wheaten hay, £7 per ton, f.o.r., Fremantle. Oaten hay, £7 5s. per ton.

Wheat.—The demand at Perth and Fremantle being principally for fowl wheat, these markets have been depressed owing to the plentiful supplies now landing ex "Penthesilea" from America. Imported wheat, nominal value 5s. 6d., f.o.r., Fremantle, whilst local wheat is being sold at 5s. 3d. per bushel, f.o.r. at country stations.

Messrs. Dalgety & Co., Ltd., report having held their usual weekly sale on Friday, 21st August, when they submitted a large and representative catalogue, in which was included a large shipment from the North-West districts. For all lines of sheepskins in good condition competition was keen at late rates, but hides and tallow continue at the values quoted last week, and at these rates there was good demand. Furred skins are now selling readily at quotations. For a few small parcels of wool to hand there was spirited bidding. Prices :—

Sheepskins—

Merino super., 6¾d. to 7¼d. per lb. ...	Crossbred super.. 7d. to 7¼d. per lb.
„ medium, 6d. to 6½d. per lb. ...	„ fine, 6½d. to 7d. per lb.
„ inferior, 5¼d. to 6d. per lb. ...	„ medium, 5¾d. to 6¼d. per lb.
„ pelts, 4¼d. to 5d. per lb. ...	„ coarse, 5d. to 5¼d. per lb.

In all classes where pelts are sun-dried, weevil-eaten, cut, torn, or perished, values are 1d. to 1½d. below quotations.

Hides—

Prime, stout, and heavy, 5½d. to 6d. per lb. ...	Prime light, 4½d. to 4¾d. per lb.
„ heavy, 5d. to 5½d. per lb. ...	... Medium, light, 4¼d. to 4½d. per lb.
Medium, heavy, 4½d. to 4¾d. per lb.	... Extra light, 4d. to 4¼d. per lb.

Attention to flaying and preparation for market is most necessary, as all damaged lots rule fully ½d. to 1d. per lb. below quotations.

Kangaroo Skins—

Grey, fresh, ½lb., 1s, 6d to 1s. 8d. per lb. ...	Red, fresh, ½lb., 1s. 2d. to 1s. 5d. per lb.
„ ¾lb. to 1½lb., 2s. to 2s. 3d. per lb. ...	„ ¾lb. to 1½d., 1s. 9d. to 2s. per lb.
„ 2lb., 1s. 7d. to 1s. 11d. per lb. ...	„ 2lb., 1s. 4d. to 1s. 8d. per lb.

Perished lots, 1s. 2d. to 1s. 6d. per lb.

Opossum Skins—

1st black, 25s. to 28s. per doz. ...	Ordinary greys and reds mixed, 7s. 3d. to 9s. per doz., average
2nd „ 12s. to 16s. per doz. ...	

Tallow—

Prime mixed, 24s. to 25s. per cwt. ...	Medium mixed, 22s. to 23s. per cwt.

Inferior mixed, 20s. to 22s. per cwt.

Messrs. Dalgety & Co., Ltd., wool and grain brokers, report as follows in connection with their Perth and Fremantle markets, for the week ending 28th August:—

Chaff.—During the early part of the week supplies came forward very slowly, and, in fact, offerings were far below consumption demands. This, however, did not continue, and on Thursday and Friday supplies showed a marked increase. Throughout the week prices generally suffered a slight decline of from 10s. to 15s. per ton on previous week's rates. However, at closing values the demand was firm, all lots selling steadily.

We sold the following chaff:—

AT PERTH.

Truck No.		Per ton.		
		£	s.	d.
6197,	ex Beverley—Prime green wheaten	6	17	6
1106,	ex Beverley—Prime wheaten	6	17	6
6178,	ex East Northam—Prime green wheaten	7	0	0
4562,	ex East Northam—Prime green wheaten	6	17	6
4153,	ex East Northam—Prime wheaten	6	10	0
3328,	ex East Northam—Prime wheaten	6	10	0
3689,	ex East Northam—Sound wheaten, purple straw	5	7	6
5999,	ex East Northam—Prime green wheaten	6	0	0
985,	ex Noggojerring—Prime green wheaten	6	17	6
4622,	ex York—Inferior wheaten	5	12	6
3025,	ex York—Prime wheaten	6	2	6
4168,	ex Wagin—Prime green wheaten	6	17	6
2669,	ex Wagin—Prime wheaten	6	7	6
4855,	ex Wagin—Medium wheaten	4	15	0
6037,	ex Wagin—Prime green wheaten	6	7	6
5533,	ex Brookton—Prime wheaten, slightly mixed	5	15	0
809,	ex Brookton—Prime wheaten, slightly mixed	6	0	0
3675,	ex Brookton—Prime wheaten, slightly mixed	6	7	6
2466,	ex Broome Hill—Good oaten	5	5	0
5356,	ex Broome Hill—Inferior wheaten	4	0	0
2432,	ex Mt. Kokeby—Dry oaten	4	15	0
1535,	ex Mt. Kokeby—Dry oaten	4	5	0
2329,	ex Mt. Kokeby—Dry oaten	4	5	0
2265,	ex Mt. Kokeby—Prime wheaten	6	7	6
3452,	ex Mt. Kokeby—Prime green wheaten	6	7	6
958,	ex Mt. Kokeby—Dry oaten	4	7	6
4135,	ex Mt. Kokeby—Dry oaten	4	5	0
917,	ex Mt. Kokeby—Prime green wheaten	6	10	2
5461,	ex Dalebridge—Good sound oaten	5	2	6
4952,	ex Woodanilling—First class wheaten	5	5	0
3699,	ex Pingelly—Extra prime oaten	6	15	6

AT FREMANTLE.

5313,	ex East Northam—Prime oaten	6	5	0
5191,	ex East Northam—Good sound wheaten	6	0	0
3843,	ex Mt. Kokeby—Medium wheaten	5	10	0
6074,	ex Noggojerring—Prime wheaten	6	15	0
4975,	ex York—Prime green wheaten	6	10	0
4700,	ex York—Prime green wheaten	6	12	6
4949,	ex York—Prime green wheaten	6	12	6
4214,	ex Grass Valley—Prime green wheaten	6	10	0
4308,	ex Grass Valley—Prime green wheaten	6	17	6
4407,	ex Pingelly—Very prime oaten	6	7	6
2202,	ex Pingelly—Prime green wheaten	6	12	6
1489,	ex Pingelly—Extra prime oaten	6	12	6

Pressed Straw.—Business dull. Very little offering.

Algerian Oats.—During the week there have been small quantities of locals on the market, the quality of which however, could not be described as prime. Heavy milling and imported and local have sold at from 3s. 9d. to 3s. 11d., whilst lighter lines have been quitted at from 3s. 6d. to 3s. 8d.

Barley.—No local offering. Prime "Chevalier," 5s. per bushel.

Hay (pressed.) —Sales of hay are not likely to assume large proportions for the next two or three months, as most buyers are now holding off. Wheaten hay has been sold at £7 per ton at Fremantle, f.o.r. Best oaten hay has realised up to £7 5s. per ton.

Wheat.—The position of the market remains practically unchanged, the lower values of imported wheat, causing almost a cessation of arrivals from the country. Imported wheat, nominal value, 5s. 6d. per bushel, f.o.r. Fremantle; whilst for large parcels even less than this price has been accepted. Local wheat is worth, nominal value, 5s. 3d. per bushel, f.o.r. at certain country stations.

KALGOORLIE MARKET.

During the past week supplies have arrived more freely than the consumption warrants, the consequence being that values have declined. Included in our offerings, there has been a large quantity of medium and inferior samples, there being a limited quantity of really prime chaff forward. We would advise sellers to on no account send anything to this market but really prime chaff, as the railage is very heavy, and this market is open for nothing but the best. During the week we sold about 40 trucks, and the following values ruled:—

Extra prime green wheaten chaff	£8 5s.
Prime wheaten chaff	£8.
Medium wheaten and oaten chaff	£7 10s. to £7 15s.
Inferior wheaten and oaten	£7 to £7 7s. 6d.

Pressed Oaten Hay.—This market offers no sale except for only a limited quantity of the very best oaten hay, there being absolutely no demand for any other quality. We sold a small quantity of local oaten hay (slightly damaged by rain) at £8 per ton.

Algerian Oats.—The foregoing remarks apply to this line equally as well, there being no sale at this centre for Algerians, other than specially prime samples suitable for racehorse feed. At the present time there is an entire absence of speculation on this market, most of the produce buyers purchasing simply for their immediate requirements.

Hides, Skins, etc.

Messrs. Dalgety & Co., Limited, report having held their usual weekly sale on Friday, 28th August, when a fair catalogue of sheepskins, hides, and pelts was submitted. Competition was easier, and late values were maintained with difficulty. A large quantity of kangaroo skins met an irregular market, and prices ruled from a 1d. to 2d. per lb. below late quotations. Opossum skins and tallow were steady at recent values.

Sheepskins—

Merino, super., 6¾d to 7¼d. per lb. ...	Crossbred, super., 6¾d. to 7d. per lb.
,, medium, 6d. to 6½d. per lb. ...	,, fine, 6½d. to 6¾d. per lb.
,, inferior, 5¼d. to 5¾d. per lb. ...	,, medium, 5¾d. to 6¼d. per lb.
,, pelts, 4¼d. to 5d. per lb. ...	,, coarse, 5d. to 5¼d. per lb.
,, ,, ¼-wools, 5d. to 5½d. ... per lb.	,, pelts, 4d. to 4½d. per lb.

In all classes where pelts are sun-dried, weevil-eaten, cut, torn, or perished, values are 1d. to 1½d. below quotations.

Hides—

Prime, stout, and heavy, 5½d. to 6d. per lb. ... Prime heavy, 4¾d. to 5¼d. per lb.
Medium heavy, 4½d. to 4¾d. per lb. ... Prime light, 4½d. to 4¾d. per lb.
Medium light, 4¼d. to 4½d. per lb. ... Extra light, 4d. to 4¼d per lb.

Attention to flaying and preparation for market are most necessary, as all damaged lots rule fully ½d. to 1d. per lb. below quotations.

Kangaroo Skins—

Grey, fresh, ½lb., 1s. 3d., to 1s. 6d. per lb. ... Red, fresh, ½lb., 1s. to 1s. 3d. per lb.
,, ¾lb. to 1½lb. 2s. to 2s. 3d. per lb. ... ,, ¾lb. to 1½lb. 1s. 9d. to 2s. per lb.
,, 2lb., 1s. 7d. to 1s. 9d. per lb. ... ,, 2lb., 1s. 4d. to 1s. 8d. per lb.
Perished lots, 1s. to 1s. 4d. per lb.

Opossum Skins—

1st black, 25s. to 28s. per doz. ... Ordinary greys and reds (mixed), 7s. 3d. to 9s. per dozen, average.
2nd black, 12s. to 16s. ,, ...

Tallow—

Prime mixed, 24s. to 25s. per cwt. ... Medium mixed, 22s. to 23s. per cwt.
Inferior mixed, 20s. to 22s. per cwt.

Messrs. Dalgety & Co., Ltd., wool and grain brokers, report as follows in connection with their Perth and Fremantle markets for the week ending 4th September:—

Right throughout the week, particularly during the first few days, chaff has been arriving to both of our coastal markets at a rate which was far in excess of actual requirements, the consequence being that values have seen a sharp decline all round of approximately 17s. 6d. per ton. During the first few days we were compelled to take off the market about 12 trucks, but these, however, have since been placed at current market rates. Farmers and others now seem more inclined to sell, and the offerings during the last few days have been the highest since the beginning of the year. The present juncture is one at which reliable statistics would be invaluable, and under present circumstances it is almost impossible to form any idea as to what stocks are still held in the country, opinions on this subject differing greatly; but, from private correspondence, we are inclined to think that there is still a fair quantity of chaff held. Bidding throughout the week was very irregular, and, anticipating an early season, buyers are only purchasing for their immediate requirements, and moreover the demand for chaff has been materially affected by the abundance of green feed right throughout the State, including the goldfields and the coastal districts. All changes affecting the present position depend entirely upon the approaching season.

We sold the following chaff:—

AT PERTH.

Truck No.		Per ton £	s.	d.
3414,	ex Grass Valley—Prime green wheaten	6	10	0
4406,	ex Gilgering—Medium wheaten	5	7	6
5374,	ex Gilgering—Medium wheaten	5	10	0
6017,	ex Dalebridge—Good oaten	5	15	0
1984,	ex Wagin—Medium wheaten	4	17	6
6159,	ex Woodanilling—Oaten and wheaten (in a heated condition)	3	2	6
870,	ex Meckering—Prime green wheaten	5	17	5
4240,	ex Meckering—Prime green wheaten	5	15	0
6086,	ex Grass Valley—Prime green wheaten	6	2	6
6135,	ex Grass Valley—Prime green wheaten	5	15	0

At Perth—*continued.*

Truck No.		Per ton. £	s.	d.
4930	ex Wagin—Prime green wheaten	6	0	0
1335	ex York—Medium wheaten	5	10	0
5301	ex Dalebridge—Prime oaten	5	2	6
3800	ex Pingelly—Prime green wheaten	6	2	6
2639	ex Wagin—Medium wheaten	4	15	0
3776	ex Wagin—Prime green wheaten	5	17	6
5463	ex Pingelly—Prime oaten (extra good sample)	6	5	0
5529	ex Wagin—Prime green wheaten	6	0	0
3667	ex Newcastle—Prime wheaten	5	15	0
3450	ex Mt. Kokeby—Dry oaten	3	12	6
3507	ex Mackie's Siding—Prime green wheaten	6	0	0
1306	ex Mackie's siding—Prime green wheaten	6	2	6
2741	ex Pingelly—Prime wheaten	5	15	0
4224	ex Grass Valley—Prime green wheaten	6	10	0
4418	ex Mt. Kokeby—Dry oaten	3	12	6
3663	ex Grass Valley—Medium wheaten (slightly heated)	5	7	6
4973	ex Mackie's Siding—Prime green wheaten	6	2	6
901	ex Gilgering—Prime wheaten	5	10	0
2549	ex Gilgering—Prime wheaten	5	15	0
2320	ex Dalebridge—Oaten	4	10	0
2314	ex Dalebridge—Oaten	4	15	0

At Fremantle.

4988	ex Grass Valley—Prime green wheaten	6	2	6
4930	ex Wagin—Prime green wheaten	6	0	0
1119	ex Meckering—Prime green wheaten	6	5	0
2592	ex East Northam—Prime green wheaten	6	0	0
1145	ex Pingelly—Prime green wheaten (extra)	6	12	6
1444	ex Grass Valley—Prime green wheaten	6	7	6
3461	ex Katanning—Prime green wheaten	6	5	0
2514	ex Capel	5	0	0
2499	ex Pingelly—Prime green wheaten	5	17	6
4990	ex Pingelly—Prime oaten	5	17	6
4985	ex Pingelly—Prime green wheaten (extra)	6	10	0
482	ex Newcastle—Medium wheaten	5	17	6
3057	ex Mackie's Siding—Medium wheaten	5	15	0
1515	ex Dalebridge—Oaten	4	17	6
78	ex Edward's King—Medium wheaten	5	17	6
5212	ex Greenhills—Extra prime green wheaten	6	12	6

Pressed Straw.—None offering.

Algerian Oats.—During the week there has been a slightly freer inquiry for Algerians, but generally there is nothing fresh to report. Heavy milling, imported and local, have sold at from 3s. 8d. to 3s. 11d., other qualities ranging from 3s. 6d. to 3s. 9d.

Barley.—There has been little inquiry for this line, and business has been practically *nil.* Nominal value, prime "Chevalier," 4s. 10d. per bushel.

Hay, Pressed.—In sympathy with chaff values hay has declined, and sales are exceedingly difficult, the inquiry being very small just now. Buyers are not inclined to purchase ahead, and are content to await the advent of the new season's stuff. Nominal values are as follows:—

Wheaten	£6 0 0 per ton
Prime oaten	6 10 0 per ton

Wheat.—Business in this line is quiet, and very little local is offering, most of the coastal business doing at the present time being confined to imported lines. Nominal value, 5s. 6d. per bushel, f.o.r. Fremantle.

KALGOORLIE MARKET.

Messrs. Dalgety & Co., Ltd., Kalgoorlie, report as follows in connection with their market for the week ending 3rd September:—

Chaff.—The position of this market has been somewhat similar to Perth and Fremantle, the conditions detailed in our Perth report exercising a similar effect on this market. During the week the arrivals have been exceedingly heavy, and as a consequence values declined, although perhaps not quite so much as at the coastal markets. The market, however, generally was weak, bidding being very irregular, but on the whole values were fairly well maintained, the decline all round equalling about 7s. 6d. per ton. It is impossible to anticipate the position of this market for the coming week, as such will be entirely influenced by the arrivals. At the present time there is little sale in Kalgoorlie for anything but really prime chaff, there being practically no demand just now for inferior and dry samples, as dairymen, who are usually principal buyers of these lines, are now off the market, having plenty of bush feed to replace chaff.

Hay.—There is little demand on this market for anything but prime oaten, but even this has practically had an end for the present, excepting for very small quantities, the Racing Carnival being now open.

Algerians.—The conditions affecting the sale of hay apply equally to Algerians, and we anticipate that business in this line for some little time will be dull.

Hides, Skins, etc.

Messrs. Dalgety & Co., Ltd., report having held their usual weekly sale on Friday, 4th September, when supplies were lighter than usual. All lots offered, with the exception of early shorn sheepskins and pelts, were keenly competed for, and showed an improvement on last week's rates, in sympathy with the latest cable report received from our London office, which read as follows: "Merino and fine crossbred combing unchanged; skins in general ⅛d. to ¼d. per lb. higher; clothing sheepskins, ⅛d., per lb. lower."

Sheepskins—

Merino, super., 6¾d. to 7¼d. per lb. ...
„ medium, 6d. to 6¼d. per lb. ...
„ inferior, 5¼d. to 5¾d. per lb. ...
„ pelts, 4¼d. to 4¾d. per lb. ...
„ „ ¼-wools, 5d. to 5½d. per lb.

Crossbred, super., 6¾d. to 7d. per lb.
„ fine, 6½d. to 6¾d. per lb.
„ medium, 5¾d. to 6¼d. per lb.
„ coarse, 5d. to 5¼d. per lb.
„ pelts, 4d. to 4½d. per lb.

In all classes where pelts are sun-dried, weevil-eaten, cut, torn, or perished, values are 1d. to 1½d. below quotations.

Hides—

Prime, stout and heavy, 5½d. to 6d. per lb. ...
„ heavy, 4¾d. to 5¼d. per lb. ...
Medium, heavy, 4½d. to 4¾d. per lb. ...

Prime light, 4½d. to 4¾d per lb.
Medium light, 4¼d. to 4½d. per lb.
Extra light, 4d. to 4¼d. per lb.

Attention to flaying and preparation for market is most necessary, as all damaged lots rule fully ½d. to 1d. per lb. below quotations.

Kangaroo Skins—

Grey, fresh, ½d. lb., 1s. 3d. to 1s. 6d. per lb. ...
„ ¾d. to 1½d. lb., 2s. to 2s. 3d. per lb. ...
„ 2d. per lb., 1s. 7d. to 1s. 9d. per lb. ...

Red, fresh, ½d. lb., 1s. to 1s. per lb.
„ ¾d. to 1½d. lb., 1s. 9d. to 2s. per lb.
„ 2d. lb., 1s. 4d. to 1s. 8d. per lb.
Perished lots, 1s. to 1s. 4d. per lb.

Opossum Skins—

1st black, 25s. to 28s. per doz.	... Ordinary greys and red mixed, 7s. 3d. to 9s. per doz., average
2nd „ 12s. to 16s. per doz.	...

Tallow—

Prime mixed, 24s. to 25s. per cwt.	... Inferior, mixed, 20s. to 22s. per cwt.
Medium mixed, 22s. to 23s. per cwt.	

GARDEN NOTES FOR OCTOBER.

By Percy G. Wicken.

The heaviest of the rainfall will now be over, and it will be necessary to begin to cultivate the surface soil frequently, so as to retain the moisture in the soil for as long as possible. Weeds, which will now be troublesome, should be hoed up and the land kept as clean as possible. All house refuse and other rubbish about the house should be stacked into a heap and allowed to decay, when it can be dug into the ground, and will make a good manure. It is surprising what a pile will accumulate in the course of a few months, and this will prove a welcome addition to the garden. If possible always avoid sowing plants of the same variety on the same ground for two seasons running; a rotation of crops should always be carried out, as certain crops remove more of one ingredient from the ground than others, and after a time the ground becomes deficient in this ingredient; whereas by carrying out a rotation some other crop is sown which removes a different ingredient, and the ground retains its fertility for a much longer period. Rotation of crops is likewise a means of keeping insect pests in check, as certain insects only feed on certain crops, and if their food supply is cut off they perish or seek fresh fields. If leguminous crops are given a prominent part in the rotation, they tend to supply a quantity of nitrogen to the soil, which is of great advantage to the following crops.

Artichokes.—Jerusalem may still be sown; they will grow quickly and give a good supply of tubers. In planting out, the tubers should not be cut into too small pieces, or a large number of misses will occur in the rows.

Beans (French or kidney).—Are one of our most valuable and prolific vegetables, and may be sown in almost all parts of the State during this month. They are best sown in drills two to three feet apart, and four to six inches apart in the drills. They require to be manured with superphosphate and sulphate of potash.

BEANS (Lima).—There are both dwarf and runner varieties. They are a delicious vegetable, and should be grown in large quantities. They may be planted and treated the same as French beans, and can be used either fresh or dried.

BEET (Red).—Sow a little seed during the month, so as to keep up a succession. The globe variety are an improvement on the long roots, and give very good results.

BEET (Silver).—This is a splendid plant to grow for a supply of green leaves for the summer, and is often the only green thing in the garden in the drier districts. They require plenty of manure. The leaves only are used.

CABBAGE.—Plant out any young plants that you may have ready, and give a drop of water to them when putting out. Plant a small quantity in beds for future use.

CARROTS.—Every garden should have a few rows of carrots. Those already up will require weeding and thinning out, and a few more rows may be sown for future use.

CELERY.—A little seed should be sown to keep up a supply. If water is available, there should be no difficulty in raising a supply. The ground requires to be well prepared previously, and plenty of good farm-yard manure dug in. A little sulphate of ammonia or nitrate of soda applied as a liquid manure at rate of 1oz. to a gallon of water will prove beneficial.

CUCUMBERS.—A few more rows may be sown to keep up a supply. Thin out and weed those already up.

EGG PLANT.—Some seed may be sown in seed bed and plants put out as soon as large enough.

LETTUCE.—Plant out young plants from seed bed, and sow a little more seed.

MELONS (Rock, water, and preserving).—May all be sown largely during the month. The holes or hills require to be well worked, and a little superphosphate worked in before sowing the seed. The preserving melons should not be planted near the water melons, or they will innoculate one another, and spoil the value of both crops.

OKRAS.—A few seeds may be sown. The seeds or pods of this plant are used for pickling.

ONIONS.—These should be mostly planted out, and should be kept free from weeds, and sow a little seed for future use.

PARSNIPS.—Sow a few rows in deeply-worked land.

POTATOES.—If not already planted, a few rows of early varieties should be put out. They should be free from scab and disease.

PUMPKINS AND SQUASHES.—Plant a large number of this useful plant; they require treating the same as melons and cucumbers, but do not plant a number of varieties as they easily become cross-fertilised and not true to name.

TOMATOES.—If sufficient plants have not already been raised, a further supply of seed should be planted for later use. As many plants as possible should be planted out early in the season, as the earliest tomatoes always command a good price. These plants require to be liberally manured with a complete manure.

FARM.—All summer crops should be sown early in the month; melons, pumpkins, maize, sorghum, cow pea, soy beans, mangels, and millets should all be sown as soon as possible, so as to enable them to get as much benefit from the moistened land before the weather becomes hot. Towards the end of the month in the Eastern district the grass will be getting dry and the danger from bush fires will be great. Every precaution should be taken to prevent loss from this source, by ploughing fire-breaks around all fields and farm buildings. The experimental farms are now open to receive students and visitors. The conditions under which students are received is published in another part of this journal. One farm is situated in the Chapman and the other at Narrogin. Visitors can leave Geraldton by train for Bowes Siding every Friday morning and the farm trap will meet them at the station and drive them to the farm, returning to meet the train on the following day. For Narrogin farm, visitors leave Perth every Tuesday, at 3·30 p.m., arriving at Narrogin at 12 p.m.; the farm trap will come into Narrogin at 9 a.m. on Wednesday morning and drive visitors out, returning in time to catch the train at 5 p.m. for Perth. Inspection of these farms is invited by all those interested. A large number of experimental crops are growing at both farms, and a visit should prove of interest.

THE CLIMATE OF WESTERN AUSTRALIA DURING AUGUST, 1903.

This month was exceptionally wintry throughout the South-West division, especially from the 1st to the 15th. The mean pressure and temperature throughout the State did not differ noticeably from the average for previous years, except in the extreme South-West, where the pressure was considerably lower than usual. The interstate reports show that this was balanced by anti-cyclonic conditions in Eastern Australia, for the mean pressure at Melbourne and Sydney was above the normal.

Two violent storms visited the West and South-West Districts; one, on the 6th, bringing an exceptional downpour, and the other, on the 14th, producing heavy gales. In connection with the former, rain commenced to fall in Perth at 5·40 p.m. on the 6th, and by 9 a.m. next day 279 points of rain were registered, two inches of this falling between 8·25 and 3·55 the following morning. This is the heaviest rainfall that has been registered at the Observatory, but before the establishment of this institution it was occasionally more severe. In connection with the second storm, the anemometer registered 508 miles between midnight and 4 p.m. on the 14th, the greatest velocity being between noon and 3 p.m., when the gale recorded 136 miles—an average of 45 miles per hour. At the Leeuwin the wind travelled 729 miles from 6 p.m. on the 13th to 6 p.m. on the 14th, and 739 miles for the following 24 hours, the greatest velocity recorded being 46 miles per hour at 8 a.m. on the 14th.

The total rainfall for the month was far in excess of the average for previous years on the West coast, and especially in the neighbourhood of Perth, but there is still a slight deficit in the amount to date since 1st January. On the goldfields there was about a normal quantity; and in the tropics, as usual at this time of year, little or no rain fell.

During the latter part of the month the weather was mostly fine, and frosts were recorded in some instances. The following table shows the mean and absolute lowest readings of a minimum thermometer placed upon the surface of the ground:—

TERRESTRIAL MINIMUM RADIATION.

Station.	Mean.	Lowest.	Date.
Cue	41·2	30·0	4
Coolgardie	37·1	31·6	25
Southern Cross	37·0	24·0	3
Walebing	36·1	24·0	1
York	39·0	29·0	1
Perth Observatory ...	44·0	33·8	18
Wandering	31·6	26·0	18 and 25
Katanning	35·0	26·0	1
Bridgetown	37·2	30·0	25
Karridale	42·0	31·0	11

The Climate of Western Australia during August, 1903.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						August, 1903.					* Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:	Wyndham ...	29·999	30·004	30·198	29·834	90·0	71·1	80·6	97·0	62·1	89·3	68·7	96·8	56·2	*Nil*	4554
	Derby ...	30·004	30·003	30·189	29·877	90·3	61·3	75·8	98·9	50·0	88·9	59·4	97·0	45·2	*Nil*	2187
	Broome ...	30·001	30·012	30·200	29·887	86·5	60·4	73·4	94·5	51·5	85·2	57·8	98·8	43·0	*Nil*	1608
	Condon ...	30·037	30·052	30·251	29·891	81·0	51·0	67·0	94·2	40·6	80·7	52·3	93·0	37·0	*Nil*	925
	Cossack ...	30·051	30·068	30·248	29·916	81·9	54·0	68·0	91·5	46·5	80·5	56·4	94·0	45·8	*Nil*	966
	Onslow ...	30·080	30·066	30·270	29·950	78·0	53·0	65·5	85·0	44·0	79·3	52·5	90·5	40 0	3	623
	Carnarvon ...	30·102	30·014	30·319	29·913	71·6	52·3	62·0	79·4	45·1	73·0	52·2	90·2	40·5	134	1150
	Hamelin Pool...	30·090	30·106	30·330	29·860	71·0	48·0	59·5	81·0	40·0	71·5	48·3	83·0	35·7	86	608
	Geraldton ...	30·120	30·130	30·360	29·750	68·0	51·0	59·5	74·0	46·0	69·4	50·5	84·8	38·9	409	1907
INLAND:	Hall's Creek *	30·026	30·038	30·275	...	88·1	49·6	68·8	94·2	34·0	85·6	52·1	95·2	32·8	*Nil*	3127
	Marble Bar ...	...	...	...	...	88·0	52·9	70·4	95·0	39·2	...	...	...	...	*Nil*	655
	Nullagine * ...	30·062	30·067	30·341	29·861	85·0	45·7	65·4	92·0	30·2	78·6	47·1	91·0	32·7	*Nil*	662
	Peak Hill ...	30·090	30·116	30·400	29·910	72·0	48·0	60·0	83·0	40·0	70·1	46·7	83·8	36·4	11	499
	Wiluna ...	30·100	...	30·446	29·892	70·9	42·5	56·7	83·6	33·0	...	...	...	...	12	713
	Cue	30·124	30·135	30·417	29·799	69·1	46·0	57·6	81·0	36·0	69·6	45·9	86·0	31·0	123	510
	Yalgoo ...	30·077	30·132	30·356	29·699	67·8	41·8	54·8	81·8	35·0	68·4	43·9	85·3	31·5	120	560
	Lawlers ...	30·106	30·131	30·440	29·850	68·7	42·8	55·8	83·2	31·4	68·0	45·0	85·2	28·2	39	862
	Laverton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	21	...
	Menzies ...	30·110	30·136	30·490	29·790	66·0	43·0	54·5	80·0	34·0	65·7	44·6	83·8	29·7	67	1220
	Kanowna ...	...	...	...	...	64·9	41·3	53·1	76·2	33·1	...	...	...	...	61	906
	Kalgoorlie ...	30·102	30·141	30·494	29·723	65·2	42·9	54·0	76·2	34·4	65·1	44·9	82·0	34·0	82	908
	Coolgardie ...	30·100	30·140	30·467	29·692	64·9	43·1	54·0	75·5	34·4	64·9	43·6	81·0	31·2	65	711
	Southern Cross	30·075	30·122	30·390	29·730	66·0	41·0	53·5	79·0	28·0	64·8	41·1	81·0	25·0	75	583
	Walebing ...	...	...	...	...	62·7	42·3	52·5	71·0	31·0	...	...	...	...	410	1645
	Northam ...	...	...	...	...	64·0	40·4	52·2	80·0	31·5	...	...	...	...	302	1056
	York	30·090	30·134	30·356	29·699	64·0	41·0	52·5	80·0	31·0	64·6	41·2	78·8	29·8	277	904
	Guildford ...	...	...	...	...	64·6	44·3	54·4	78·8	35·0	...	...	...	...	787	2265

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* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during August, 1903—*continued.*

Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
					August, 1903.					*Average for previous Six Years.					
	Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
SOUTH-WEST AND SOUTH COAST:															
Perth Gardens ...	30·090	30·113	30·366	29·607	64·1	47·8	56·0	77·4	40·8	65·5	47·2	83·5	33·6	881	2339
Perth Observatory	30·092	30·127	30·368	29·619	63·2	47·7	55·4	77·4	40·1	64·2	48·0	80·4	37·5	925	2380
Fremantle ...	30·093	30·102	30·357	29·625	62·9	50·8	56·8	71·0	45·5	63·7	51·1	77·3	41·0	751	2295
Rottnest ...	30·060	30·093	30·330	29·565	62·7	53·1	57·9	71·0	48·4	63·4	53·4	76·2	46·2	698	2182
Mandurah ...	...	...	...	...	63·0	46·4	54·7	72·0	36·0	...	...	...	...	709	2560
Wandering ...	...	...	...	...	58·5	34·3	46·4	70·0	29·0	...	...	...	...	635	1832
Collie	...	...	...	...	61·2	38·1	49·6	76·0	31·2	...	...	...	...	621	2487
Donnybrook ...	...	...	...	...	63·3	47·5	55·4	74·2	32·1	...	...	...	...	674	2540
Bunbury ...	30·055	30·120	30·360	29·550	62·0	47·0	54·5	70·0	40·0	64·1	46·8	75·5	33·2	885	3357
Busselton ...	...	...	...	...	61·6	45·1	53·4	67·0	38·5	...	...	...	...	622	2200
Bridgetown ...	...	...	...	...	61·4	39·2	50·3	75·0	31·0	...	...	...	...	66	2204
Karridale ...	30·000	30·102	30·340	29·484	62·0	46·0	54·0	69·0	35·0	62·0	46·3	74·4	32·5	767	2993
Cape Leeuwin ...	29·980	30·058	30·330	29·400	61·0	52·0	56·5	70·0	46·0	61·9	52·6	72·3	43·8	567	2091
Katanning ...	30·050	30·109	30·340	29·610	59·0	41·0	50·0	74·0	33·0	60·4	41·3	75·1	30·8	314	1457
Albany	30·010	30·079	30·364	29·504	61·6	43·6	52·6	76·0	33·8	61·8	46·0	77·5	36·6	611	2745
Breaksea... ...	30·000	30·076	30·390	29·480	59·0	49·0	54·0	69·0	41·0	60·0	50·0	71·8	34·5	538	1999
Esperance ...	30·055	30·106	30·370	29·620	63·0	47·0	55·0	72·0	34·0	64·2	46·8	82·8	36·5	487	1675
Balladonia ...	30·092	...	30·498	29·708	65·4	40·0	52·7	78·9	32·0	...	...	...	...	46	585
Eyre*	30·078	30·140	30·540	29·700	65·4	43·7	54·6	86·0	30·0	64·6	43·8	88·7	29·1	70	927
INTER-STATE.															
Perth	30·092	30·127	30·368	29·619	63·2	47·7	55·4	77·4	40·1	64·2	48·0	80·4	37·0	925	2380
Adelaide	30·132	30·125	30·480	29·841	62·2	45·4	53·8	70·0	37·6	62·0	45·8	82·0	32·3	...	...
Melbourne	30·144	29·981	30·450	29·773	58·2	41·1	49·6	67·8	30·3	58·8	43·2	77·0	28·3	48	...
Sydney	30·240	29·100	30·500	29·920	60·0	47·0	53·5	70·0	43·0	62·2	47·6	82·0	36·8	516	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
7th September, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for July, 1903 (completed as far as possible), and for August, 1903 (principally from Telegraphic Reports).

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham	Nil	...	Nil	...
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek	Nil	...	Nil	...
Plympton, St. Mary	...	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	Nil	...	Nil	...
Flora Valley	...	...	...	...
Ruby Plains	...	...	...	...
Denison Downs	Nil	...	...	...
West Kimberley:				
Obagama	...	...	...	...
Beagle Bay	...	...	...	...
Derby	Nil	...	Nil	...
Yeeda	Nil	...	...	...
Liveringa	Nil	...	...	...
Mt. Anderson	...	...	...	...
Leopold Downs	Nil	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun	...	...	...	...
Nookanbah	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	...	...	...	...
Thangoo	...	...	...	...
La Grange Bay	Nil	...	Nil	...
North-West:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	Nil	...
DeGrey River	Nil	...	...	...
Port Hedland	Nil	...	Nil	...
Boodarie	Nil	...	...	...
Warralong	Nil	...	...	...
Muccan	Nil	...	...	...
Ettrick	...	...	...	...
Mulgie	Nil	...	...	...
Eel Creek	Nil	...	...	...
Pilbarra	Nil	...	Nil	...
North-West—*cont.*				
Coongon	...	...	...	...
Warrawagine	Nil	...	...	...
Bamboo Creek	11	1	Nil	...
Marble Bar	Nil	...	Nil	...
Warrawoona	Nil	...	Nil	...
Corunna Downs	Nil	...	...	...
Nullagine	Nil	...	Nil	...
Yandicoogina	...	...	...	...
Kerdiadary	...	...	...	...
Roy Hill	Nil	...	...	...
Mosquito Creek	Nil	...	...	...
Mulga Downs	...	...	...	...
Woodstock	Nil	...	...	...
Mt. Florence	...	...	...	...
Tambrey	Nil	...	...	...
Millstream	Nil	...	...	...
Yandyarra	...	...	...	...
Mallina	...	...	...	...
Whim Creek	Nil	...	Nil	...
Cooyapooya	...	...	...	...
Woodbrooke	...	...	...	...
Croydon	...	...	...	...
Balla Balla	Nil	...	Nil	...
Roebourne	Nil	...	Nil	...
Cossack	Nil	...	Nil	...
Fortescue	10	1	Nil	...
Mardie	20	1	...	...
Mt. Stewart	100	1	...	...
Yarraloola	...	...	...	...
Chinginarra	75	1	...	...
Onslow	57	2	3	1
Peedamullah	...	...	...	...
Red Hill	97	1	...	...
Mt. Mortimer	70	1	...	...
Wogoola	...	...	...	...
Nanutarra	57	1	...	...
Yanrey	...	...	...	...
Point Cloates	...	...	...	...
Gascoyne:				
Winning Pool	107	2	...	...
Towara	106	3	...	...
Ullawarra	62	2	...	...
Maroonah	...	...	...	...
Gifford Creek	52	1	...	...
Bangemall	29	2	...	...

RAINFALL—*continued.*

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Mt. Augustus ...	...	...	...	...
Minnie Creek ...	81	3	...	...
Yanyeareddy ...	149	4	...	...
Williambury ...	105	4	...	...
Wandagee ...	97	2	...	...
Bernier Island ...	201	6	70	6
Boolathana ...	125	3	...	...
Carnarvon ...	211	5	134	5
Cooralya... ...	...	...	...	...
Doorawarrah ...	67	4	...	...
Mungarra ...	49	4	...	...
Clifton Downs ...	39	5	...	...
Dairy Creek ...	60	2	...	...
Upper Clifton Downs	44	4	...	...
Errivilla... ...	...	...	...	...
Dirk Hartog Island	161	9	...	...
Sharks Bay ...	113	5	90	3
Kararang ...	181	8	...	...
Meedo	77	5	...	...
Tamala	155	8	...	...
Wooramel ...	92	6	194	5
Hamelin Pool ...	91	7	86	5
Byro	...	...	...	...
Berringarra ...	22	2	...	...
Mt. Gould ...	50	3	...	...
Moorarie ...	31	1	...	...
Wandary... ...	80	3	...	...
Peak Hill ...	40	3	11	2
Horseshoe ...	37	4	17	2
Mount Frazer ...	73	3	...	...
Abbotts	56	2	53	3
Belele	68	2	...	...
Mileura	51	2	...	...
Manfred ...	91	4	...	...
New Forest ...	99	4	...	...
Woogorong ...	120	4	...	...
Twin Peaks ...	105	5	...	...
Billabalong ...	101	4	...	...
Wooleane ...	98	4	...	...
Murgoo	118	3	...	...
Meeka	98	5	...	...
Mt. Wittenoom ...	108	7	...	...
Nannine	106	5	42	3
Star of the East...	109	5	44	3
Annean	96	4	20	1
Tuckanarra ...	71	5	121	7
Coodardy ...	79	3	71	5

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Gascoyne—*contd.*				
Cue	69	3	123	7
Day Dawn ...	52	3	82	4
Lake Austin ...	68	4	94	6
Lennonville ...	61	6	110	6
Mt. Magnet ...	71	5	114	6
Challa	62	5	...	...
Youeragabbie ...	36	3	...	...
Murrum	27	2	...	...
Burnerbinmah ...	95	3	...	...
Barnong... ...	163	5	208	6
Yalgoo	84	4	120	5
Gabyon	97	4	152	4
Wurarga ...	141	3	133	4
Gullewa	161	5	185	5
South-West Division (Northern Part):				
Murchison House	390	10	362	10
Mount View ...	274	6	...	...
Mumby	459	13	322	9
Northampton ...	482	13	442	8
Mt. Erin ...	371	10	...	...
Oakabella ...	533	13	460	10
Narra Tarra ...	378	8	...	...
Tibradden ...	433	13	467	7
Sand Springs ...	376	10	351	8
Mullewa... ...	312	10	263	8
Kockatea ...	315	9	346	9
Bootenal ...	329	8	...	...
Geraldton ...	528	15	409	11
Greenough ...	432	11	612	11
Dongara ...	338	13	416	9
Dongara (Pearse)	329	13	368	8
Strawberry ...	324	8	...	...
Nangetty ...	267	9	238	5
Mingenew ...	293	12	293	11
Urella	263	10	279	9
Yandenooka ...	311	13	386	9
Rothesay ...	173	5	189	7
Field's Find ...	149	5	...	...
Carnamah ...	255	11	322	10
Watheroo ...	268	13	297	14
Dandaragan ...	446	16	328	13
Moora	421	11	391	10
Yatheroo ...	419	13	449	13
Walebing ...	369	12	410	11
New Norcia ...	285	13	381	13

RAINFALL—*continued.*

Stations.	July.		August.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-Western Division, Central (Coastal):				
Gingin	619	17	853	15
Belvoir	492	12	760	14
Mundaring	603	15	917	16
Guildford	431	17	787	15
Kalbyamba	630	12	...	...
Canning W't'r'w'ks	623	14	705	12
Perth Gardens	449	18	881	17
Perth Observatory	496	18	925	17
Subiaco	525	17	883	17
Claremont (Richardson)	531	16	860	15
Fremantle	573	19	751	17
Rottnest	490	19	681	18
Armadale	406	13	907	16
Rockingham	682	16	719	15
Canning River	582	12	1130	13
Jarrahdale	783	15	1106	12
Mandurah	649	15	709	13
Pinjarra	867	18	801	14
Yarloop	670	20	854	16
Harvey	704	18	723	15
South-West, Central Part (Inland):				
Hatherley	179	11	221	9
Momberkine	215	9	...	...
Monglin	276	13	...	...
Newcastle	265	12	403	12
Eumalga	340	14	402	14
Northam	212	11	302	10
Grass Valley	197	13	236	10
Meckering	126	9	180	11
Cunderdin	173	10	194	12
Codg-Codgen	184	16	157	12
Jarragin	207	13	...	...
Doongin	126	9	189	10
Cuttenning	118	14	189	13
Whitehaven	165	16	241	13
Sunset Hills	210	10	258	11
Cobham	226	16	328	16
York	170	15	277	14
Beverley	170	12	314	10
Barrington	191	13	237	11
Stock Hill	262	12	339	10
Sunning Hill	214	12	375	11
Wandering	319	15	635	12
South-West—*contd.*				
Glen Ern	230	19	421	14
Pingelly	223	12	345	9
Woogenellup	396	18	275	15
Marradong	409	12	606	12
Bannister	392	13	...	...
Narrogin	257	15	313	12
Wickepin	281	14	401	12
Gillimaning	213	14	330	14
Bunking	233	7	254	8
Bullock Hills	282	13	223	10
South-West Division (Southern Part):				
Bunbury	922	17	885	15
Collie	612	20	621	16
Glen Mervyn	599	15	677	14
Dardanup	648	15	759	14
Donnybrook	636	15	674	17
Boyanup	755	14	760	16
Ferndale	644	21	680	19
Busselton	486	20	622	21
Quindalup	...	...	675	21
Lower Blackwood	860	21	1023	23
Karridale	719	24	767	27
Cape Leeuwin	520	25	567	28
Biddellia	859	23	...	...
The Warren	898	23	...	...
Lake Muir	454	23	...	...
The Peninsula	622	25	...	...
Mordalup	350	22	442	17
Deeside	409	24	...	...
Riverside	444	25	...	...
Balbarup	637	17	535	17
Wilgarup	616	24	527	19
Mandalup	623	17	668	16
Bridgetown	585	26	566	23
Westbourne	446	22	495	19
Hilton	438	15	523	10
Greenbushes	568	15	660	15
Greenfields	570	18	507	10
Glenorchy	333	12	447	12
Williams	321	17	428	16
Arthur	286	11	302	9
Darkan	399	12	...	...
Wagin	278	15	267	10
Glencoe	334	14	234	14
Dyliabing	295	19	...	...
Katanning	296	18	314	14

RAINFALL—*continued.*

STATIONS.	JULY.		AUGUST.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*				
Kojonup ...	536	23	430	14
Broomehill ...	416	16	505	13
Sunnyside ...	313	16	203	14
Woodyarrup ...	302	14	268	15
Cranbrook ...	362	18	...	...
Blackwattle ...	459	18	...	...
Mt. Barker ...	497	22	336	15
Kendenup ...	485	23	272	16
Forest Hill ...	667	25	416	20
Denmark ...	773	25	675	20
Grasmere ...	672	25	616	23
Albany	771	24	611	22
Point King ...	756	23	746	20
Breaksea ...	468	24	538	22
Cape Riche ...	307	18	...	...
Pallinup ...	255	16	207	12
Bremer Bay ...	412	18	373	16
EASTERN DIVISION:				
Dural	60	2	...	...
Lake Way ...	58	6	12	3
Gum Creek ...	83	2	...	...
Mt. Sir Samuel ...	59	4	28	4
Lawlers	41	5	39	4
Leinster G.M. ...	70	4	60	4
Lake Darlot ...	49	3	18	2
Mt. Leonora ...	44	5	37	4
Mt. Malcolm ...	17	2	52	5
Mt. Morgans ...	36	5	10	2
Burtville ...	40	2	...	...
Laverton ...	37	4	21	2
Murrin Murrin ...	46	5	30	4
The Granites ...	34	3	18	2
Tampa	52	3	21	1
Kookynie ...	69	3	65	4
Niagara	92	3	55	3
Yerilla	50	4	62	4
Edjudina ...	75	6	...	...
Menzies	73	4	67	6
Mulline	90	3	117	5
Waverley ...	95	4	73	6
Goongarrie ...	65	3	50	4
Mulwarrie ...	112	5	114	6
Kurawa	102	8	58	5
Kurnalpi ...	87	6	48	5

STATIONS.	JULY.		AUGUST.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EASTERN—*contd.*				
Bulong	67	10	62	5
Kanowna ...	120	...	61	5
Kalgoorlie ...	116	8	82	5
Coolgardie ...	130	8	65	4
Burbanks P.O. ...	131	9	75	5
Woolubar ...	102	11	55	4
Widgiemooltha ...	130	9	35	4
50-Mile Tank ...	125	9	38	4
Waterdale ...	119	9	...	...
Norseman ...	105	10	32	4
Lake View ...	139	13	67	5
Bulla Bulling ...	139	6	71	4
Woolgangie ...	149	5	87	5
Boorabbin ...	128	11	76	5
Karalee	125	5	118	5
Yellowdine ...	109	4	94	6
Southern Cross ...	116	8	75	8
Mt. Jackson ...	109	4	...	...
Bodallin ...	164	5	91	5
Burracoppin ...	151	5	121	5
Kellerberrin ...	105	12	170	10
Mangowine ...	163	13	185	11
Wattoning ...	156	5	...	...
EUCLA DIVISION:				
Ravensthorpe ...	202	16	103	8
Coconarup ...	175	15	120	11
Hopetoun ...	398	18	189	12
Fanny's Cove ...	467	17	602	12
Park Farm ...	426	21	519	15
Esperance ...	450	22	487	18
Gibson's Soak ...	418	19	315	13
30-Mile Condenser	350	15	204	12
Swan Lagoon ...	292	18	...	...
Grass Patch ...	308	19	116	10
Myrup	494	20	...	...
Lynburn ...	362	15	471	14
Boyatup	414	17	...	...
Point Malcolm ...	241	16	295	14
Israelite Bay ...	179	15	158	9
Frazer Range ...	147	16	...	...
Balladonia ...	73	10	46	...
Southern Hills ...	...	...	...	...
Eyre	185	13	70	8
Eucla	92	15	56	4

The Observatory, Perth,
8th September, 1903.

W. E. COOKE,
Government Astronomer.

By Authority: WM. ALFRED WATSON, Government Printer, Perth.

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WESTERN AUSTRALIA.

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NOTES.

Stud Bulls.—The Acting Director of Agriculture desires it to be known that the Government bulls that were for sale are now all disposed of.

Paspalum Roots.—Mr. T. Ilberry, of "Rahnie," Wooroloo, Eastern Railway, has a quantity of paspalum roots for sale. Anyone wishing to plant some of this most valuable fodder grass will do well to write to Mr. Ilberry for particulars.

Fungoid and Insect Pest.—Bulletin No. 5, just issued by the Department of Agriculture, dealing with fungoid and insect pests of Western Australia, together with remedies and a list of beneficial insects, may be had on application, or a copy will be sent free on receipt of 2d. in stamps to pay for postage.

Prizes for Separators.—The Russian Department of Agriculture is offering two prizes for the best separators of average dimensions and capable of treating from 16 to 20 gallons of milk an hour. The competition is open to foreigners, and entries must be made before 28th February, 1904. The prizes will be 1,500 roubles and 500 roubles, or about £165 and £55 respectively.

Spray for Codlin Moth.—So far we have not heard of the present existence of the codlin moth in this State beyond the isolated cases reported last year, when prompt measures were taken to eradicate it. But, as to be forewarned is to be forearmed, we would advise all orchardists to note that the best spray used so far by South Australian fruitgrowers has been one composed of 3oz. of Paris green, half a bar of common yellow soap, and 100 gallons of water.

Annual Shows.—We have again to complain of the secretaries of Agricultural Shows, in neglecting to furnish the *Journal* with particulars of their respective shows, consequently we are beholden to the daily Press for a copy of the prize lists. In addition to this neglect, the opportunity is lost of publishing comments and notes that could be supplied by no one better than the secretary under whose care and supervision the show is conducted. We trust that the Secretaries of future shows will take the hint and send in their report.

Laying Record.—A correspondent living at West Perth, who is a great fancier of Indian Runner ducks, has just had a record for a month's laying. Five ducks layed every day for the 30 days with but two exceptions, when only four eggs were layed: so that 148 eggs were obtained from the five birds in the time under review. As each egg turned the scale at three ounces, a total weight of 27¾lbs. was realised. Allowing for the birds to go eight pounds each, then they would yield eggs equal to their own weight in a couple of days over the six weeks. Truly, this must be a profitable breed.

Sparrows for Farmers.—In view of the pest small birds have become in New Zealand, the following paragraph from *Cassell's Illustrated Family Paper* of 15th October, 1859, will excite some comment and provoke not a little strong language:—"Use of Sparrows.—Three hundred sparrows, carefully selected from the best hedgerows in England, have been lately sent to New Zealand. The food alone put on board for them cost £18. The necessity of small birds to keep down the grubs that devastate the crops in that colony has long been felt. The farmer is beset by myriads of caterpillars. Should the sparrows become acclimatised and multiply, the greatest benefit will have been conferred on the country."

New Cure for Ticks.—A prominent breeder of shorthorn cattle in Colorado, U.S.A., in an interview, of which a notice appears in the *Texas Stock Journal*, makes the following remarks on the new mode of treating cattle that are attacked with ticks. He purchased a lot of registered shorthorns a few years ago without noticing that they were carrying the fever tick. As the disease developed several of his best cattle died of fever, and, as he says, "that put me thinking pretty hard." He adopted a remedy that was being talked of at the time, and he gives the following description of his mode of treatment:—"I began to feed my cattle sulphur with their salt every day in the proportions of one part of sulphur to two parts of salt, in order to induce them to shed their ticks, and the remedy worked like a charm. When the ticks had dropped off I proceeded to move all my cattle into a clean pasture, where I knew there were no ticks, and kept them off that old pasture for a month or two, until I believed the old crop of ticks were dead, and their progeny had also passed out of existence from the lack of material upon which to develop. My plan worked well, and I adhered to this policy of moving the cattle as a few ticks would appear, until I finally starved the whole tick family out of existence, and my pastures are to-day as clean as any located above the state quarantine line. My experience has demonstrated to my complete satisfaction that the tick problem after all is one of easy solution."

KEEPING THE RECORDS.—At a recent meeting of a dairy association in Canada, Professor J. W. Robertson, Dominion Dairy Commissioner, advised the adoption of a system which has been put into practice in Denmark during the last five years. In that enterprising little country the farmers had formed themselves into little associations of 12 men each. Each member of these little groups agreed to keep a weekly record of the amount of feed each cow consumed, and also weigh accurately the quantity of milk each animal gave weekly. A test was then made, and the exact relation between the two facts was ascertained. There were 50 of these associations in Denmark, and since they have been in existence they had done a valuable work of education, for, owing to their records, it had been possible to increase the flow on each 5,100 odd pounds of milk per group at the start 942 pounds in three years—to 6,000 odd pounds—and the yield per cow from 194 pounds to 244 pounds. In fact, he had no hesitation in predicting that a course of five years' judicious selection and intelligent effort such as this, in Canada, would result in a gain of 20 per cent. in their general average of milk and butter. If the farmers in this section cared to try the scheme during the coming season his department would assist them all it could, and send a qualified man down specially to instruct them in all the details of these admirable little Danish associations.

AGRICULTURAL LECTURES.

By Percy G. Wicken.

THIRTY-SECOND LECTURE.

SHEEP.

Sheep belong to the order *Ruminantia*, and are the genus *Ovis—Ovis aries*. They were of the first animals domesticated by man, and supply the two principal wants of the human race, *i.e.*, food and clothing. They are to be found in almost every country of the civilised world, and from the earliest periods of history we have records of sheep being kept for domestic purposes.

Sheep-breeding has played a very important part in the industrial development of the Australian States, and although suffering from a severe depression at the present time owing to the prolonged drought, it may be said that the staple product of the Australian States has been wool; and just previous to the present period of drought, frozen mutton was being exported from the Eastern States in increasing quantities. At the present time New Zealand is the only part of Australasia which is able to continue to export meat.

The following table is interesting, showing the rapid increase of sheep in Australia during each decade:—

In	1788	there were in Australian colonies	...	29	sheep
„	1798	„ „	...	3,902	„
„	1808	„ „	...	10,157	„
„	1818	„ „	...	170,420	„
„	1828	„ „	...	1,090,089	„
„	1838	„ „	...	6,202,430	„
„	1848	„ „	...	19,382,453	„
„	1858	„ „	...	17,091,798	„
„	1868	„ „	...	40,915,817	„
„	1878	„ „	...	48,063,931	„
„	1888	„ „	...	79,679,235	„
„	1898	„ „	...	100,470,162	„
„	1901*	„ „	...	92,441,835	„

* The last year available.

Of this number 2,625,855 are in Western Australia, and 41,857,099 (or half the total) in New South Wales. Of this number New South Wales last year lost 15,000,000 by drought, and now only has 25,000,000. The total number of sheep in the world is between 600 and 700 millions.

The Merino Sheep.—The term merino is a word derived from the Spanish "merinos," which means "a superintendent of sheep walks," and the merino sheep is generally acknowledged to be a race of sheep bred in Spain. They are supposed to have been introduced into Spain from Asia as far back as the year B.C. 1100, and from the earliest records Spain was celebrated for its excellent breed of sheep. After the Peninsular war the Spanish sheep were so neglected, owing to the state to which the nation was reduced, that they became almost worthless, and after having been noted for their good qualities for upwards of 25 centuries, they are almost unknown in their native country. Before the war, however, large numbers of these sheep were exported to other countries, where they have done well. Of late years, however, Spain has been importing back some of the progeny of the sheep exported years ago, and is making an attempt to again improve the breed, but with only partial success. In 1779, 3,000 merino sheep were obtained from Spain by the French Government, and 60 stud farms were established to try and obtain a breed of sheep equal to the Spanish. Rambouillett was the most successful of these, and breeders in Australia and America have drawn largely from this farm for their stud stock. As early as the fifteenth century some merino sheep were introduced into England, but they appear to have died out. Sheep were at this time not allowed to be sent out of Spain, and the earliest record we have of any coming to England is in 1787, when George III. collected a few together on the shores of Portugal and smuggled them on board ship at Lisbon. They were landed at Portsmouth and transferred to Kew, but the King was not satisfied with them, and had them destroyed. He then made direct application to the King of Spain for some of his best sheep. The application was successful, and the sheep sent over, but being placed on some rich, well-grassed country, soon exhibited symptoms of foot-rot, but when moved to higher and drier ground were found to be as healthy as any other British breed. The merino sheep found many advocates in England, among whom were Lord Summerville and Sir Joseph Banks, but they had many prejudices to encounter, being small in carcass, and the wool not altogether suitable for the manufacturers of the day. George III. bred from these sheep for 13 years before he sold any of the flock, and in 1804 he had his first sale, and the highest price he obtained for a ram was 42 guineas. After this he held yearly sales. In 1811 a merino society was established, and Sir Joseph Banks was the first president. Forty-five vice-presidents were elected, and branch societies were established all over the kingdom, but the breed never became favourites and the society went down, and very few merino sheep now remain in the United Kingdom.

The first merinos were imported from Spain into America in 1793, but died out; early in the next century, however, they became very popular. In 1809, at a sale in Spain, the American consul purchased 1,700 pure merino sheep and sent them to America. The following year he sent 3,850, besides 2,500 sent by private persons. Between 1809 and 1811, no less than 106 vessels, carrying 15,767 sheep, left Spain for America.

To come nearer home, the first merinos introduced into Australia reached Sydney from the Cape of Good Hope. They were brought from Spain to the Cape by Colonel Gordon, who died shortly after their arrival. The sheep were sold and were bought by Captain Waterhouse, of the "Reliance," at £4 per head, who brought them to Sydney; there were 13 head landed. On their arrival at Sydney Captain McArthur offered 15 guineas each for them, but this was refused, and they were then sold to other people, Captains Kent and McArthur, Messrs. Marsden, Laycock, and Cox (all names now well known to sheep breeders), being the principal purchasers. The Hon. G. H. Cox, of Mudgee, N.S.W., has some of the descendants of these sheep yet.

The Van Diemen's Land Co., of Tasmania, were large importers of sheep from George III. flock, and also from Germany. This company was founded in 1825, and between that and 1830 they expended £30,000 on the purchase of sheep.

The Australian States are largely indebted to this company for the introduction of merino sheep. Most of the best sheep brought to Victoria, New South Wales, and South Australia in the early days were imported by this company; they had yearly sales of rams, and did much to establish sheep-breeding as an industry. Tasmanian merinos are well known, and are celebrated for combining great length of staple with a fine, bright lustrous fleece.

In the year 1829, the ship "Caroline" was chartered by Mr. T Henty, of Sussex, England, who sent out by her to Western Australia, in charge of his three sons, a large number of merino sheep, some settlers from his own parish, and several thoroughbred horses, obtained from the Earl of Egremont's stud. They arrived safely at the Swan River and settled there for a time, but, considering the climate did not suit their stock, they, in 1831, shipped them in the "Cornwallis," and went to Tasmania. These were probably the first sheep landed in Western Australia.

In February, 1830, a Mr. Hall brought 25 merino sheep to Fremantle in the barque "Protector"; these sheep were landed and allowed to go in the bush, and were never heard of again; they were either killed by dogs or else poisoned through eating poison bush. Dr. Foley brought out 30 merino sheep and a shepherd by the same vessel; these were landed at Fremantle, were well looked after, and did very well, and were afterwards sold to Mr. G. Fletcher Moore.

In 1833-34 Mr. A. Trimmer imported 300 merino ewes; and these were the first sheep that were sent to the Eastern districts. They were driven overland from Guildford to York, and although the country was thick with poison bush, none of the sheep were lost on the journey; these sheep, no doubt, formed the nucleus of the flocks now in the Eastern districts. Mr. W. Padbury, now living in Perth, was one of the men employed in driving this flock of sheep to York. In those days most of our mutton was imported from Tasmania, and was of poor quality, and sold at 1s. 6d. per lb.

A few years later Mr Lionel Lukin imported some 300 merino ewes, and these were sent to the Newcastle or Toodyay district.

In 1863 Messrs. Padbury, Wellard, and Withnell chartered the barque "Tein Tein" for two trips from Fremantle to Nicol Bay, and took with them a large number of merino sheep, this was the first settlement and the first sheep taken to the North-West districts. Sheep-breeding has now become general, and some very good flocks are established, especially in the North-West districts; and a large number of fresh stud sheep are imported from the Eastern States every year.

Rams of this breed have fetched some extraordinary prices at the sheep sales in Sydney and Melbourne, over 4,000 guineas having been paid for champion animals. Merino rams have been known to cut as much as 25lbs. weight of wool, and a flock of good rams have averaged over 20lbs. per fleece.

The points of the Merino.—The principal objects, as far as the frame is concerned, are simply to secure—first, a good, large, and well-developed wool-growing surface; and secondly, to make certain that the animal is of robust constitution, having no taints which may possibly be transmitted to its posterity in an exaggerated degree. The barrel should be round, the back short, level, and strong; the neck should be short and deep, the shoulders broad and massive. The muzzle should be clean, the nostril expanded, and the nose white, wrinkly, and covered with short, furry, soft, velvety hair. The fore legs should be short, straight, and well apart. The horns in the ram should not be too close to the head and neck, nor standing out too widely.

THE VERMONT is a type of Merino which has been produced in Vermont, U.S.A., and has been much used in the Australian States for improving the Australian type of Merino. The characteristics of this type were a wool that was full of curls and a skin that was very much folded. The Hon. S. McCaughley, of Coonong, as well as other breeders, have imported some splendid animals of this type. Messrs. McFarland Bros., Baroga station, N.S.W., imported two rams, Matchless and New York. Matchless cut 28lbs. 12ozs. of wool and New York 32lbs., and these two rams increased the weight of the wool of the whole flock by about 2½lbs. per fleece.

THIRTY-THIRD LECTURE.

SHEEP—*continued.*

LINCOLN SHEEP.—Next to Merinos in importance come the Lincoln. Little is known of the origin of this breed, but they are supposed to be indigenous to county Lincoln, and are said to be the original of all long-wool breeds of sheep. The old Lincoln was a huge ungainly animal, standing on high, bony legs, and a large coarse carcase. These old breeds have now disappeared, and the Lincoln of the present day is a much more symmetrical animal; he does not stand so high on his legs. The carcase is still large, weighing from 120lbs. to 150lbs. The shoulder is very forward, neck thick, face and legs perfectly white, with a tuft of wool on the face, and no horns; the wool very long, producing heavy fleeces, ranging from 12lbs. to 25lbs. in best animals; hoggets' wool has been known to reach 15 inches in length. Lincolns were first imported into the colonies about the same time as Merinos, by the Van Diemen's Land Company, about the year 1810. Some grand fleeces have been obtained from Lincoln sheep in Australia, as much as 30lbs. in the greese having been shorn from a ram, and a flock of 50 ewes has averaged 16lbs. per fleece. The Lincoln ram is invaluable for crossing with the Merino ewe for the purpose of producing a good cross-bred sheep. The Lincoln is not a breed of sheep adapted for roughing it, and has been raised in one of the richest parts of England; they require more food than the Merino, and will not yield a profitable return on poor country.

THE BORDER LEICESTER is a more modern sheep, and is supposed to have been produced by crossing Bakewell's celebrated Leicester with the Cheviot sheep. The Border Leicesters do not feed so rapidly as the improved Leicesters, but they are more hardy, stronger in constitution, more suitable, and adapt themselves better to differences of soil and climate. The leading points of the Border Leicesters are: Head large, wide nostrils, face white, eyes full, bright, and bold-looking; chest deep, back straight, well-developed rump, well-sprung ribs, legs white, strong, and rather long. These sheep are sometimes deficient in the hind-quarters. The mutton has an excellent flavour, and good sheep weigh from 100lbs. to 120lbs. The wool is sound, and fetches a good price, but is not so dense or lustrous as the Lincoln.

THE IMPROVED LEICESTER.—This breed owes its origin to Robert Bakewell, who devoted a great part of his life to improving this breed. He commenced operations about the middle of the eighteenth century. His system was to put the best to the best, irrespective of relationship; he selected the best sheep of the county breed, but did not cross with any other type. At first he did not make much headway, but after a number of years they improved very considerably; and in 1779 he received £1,200 for the hire of three rams for one season, £2,000 for seven others, and £3,000 for the balance; he thus netted £6,200 in one season for the hire of rams.

This breed possess great aptitude to fatten, and are ready for the butcher very early. Improved Leicester rams have been used to improve most breeds of long-wooled sheep in Great Britain.

The leading points differ from the border Leicester—viz.: Head small; eyes mild, full, and prominent; ears thin, long, and fine; face white; back perfectly straight; breast broad and well forward; legs short and wide apart; weight from 100lbs. to 130lbs., and have abundance of external fat. The wool is fine and very crimpy, and the fleece weighs on an average 8lbs. to 12lbs.

THE COTSWOLD SHEEP are indigenous to the Cotswold Hills in Gloucestershire, and are the largest domesticated sheep in the world. They are said to be named from the "cots or sheds" in which they were housed at night, and "the wolds" or open, hilly country on which they pastured during the summer. They have large frames and heavy fleece, and the flesh is rather open and coarse, but the fat well mixed. There is a good demand for them in America and New Zealand. The wool is very long, but rather open, and much coarser in fibre than either the Leicester or Lincoln; the face white, sometimes mottled; ears very small for size of sheep; neck long and thick; legs white and rather short; head very wide across the forehead, and face covered with wool.

THE CHEVIOT SHEEP are bred on the Cheviot Hills, in the Northern counties of England, and are a distinct type of sheep. They have no horns; face and legs white; eyes small and prominent and very lively; body and legs both long; wool close and fine. They are exceedingly hardy, and have been known to be buried in the snow for 13 days, and to have then recovered. They will travel long distances. The mutton is sweet and delicate, and they fatten very quickly.

THE HIGHLAND BLACK-FACED SHEEP.—Generally supposed to be the native sheep of the Highlands of Scotland, and the influence of climate is well shown; the sheep is completely covered with wool, which is of an inferior quality. They are particularly adapted to stand a severe climate

THE DORSET SHEEP.—These sheep resemble the Merino more than any other British breed; both ewes and rams have horns; they are very prolific, and lamb very early in the season. The face and legs are white, the face is long and broad, and there is a tuft of wool on the forehead; the shoulders are low but broad, and the bone small. They are a hardy and useful breed, and the mutton is well flavoured; they mature quickly. This breed is coming into great favour at the present time.

THE LONG-WOOLED DEVON SHEEP somewhat resembles the Lincoln, and originated in County Devon. They are not quite so large as the Lincoln, are coarser boned, and do not show so much breeding. The face white, and a lock of wool on the forehead. They are not a well-known breed.

THE ROMNEY MARSH SHEEP are bred in the Romney Marsh district, which is a low-lying, marshy district on the coast of Kent, and has been reclaimed from the sea. They are celebrated for being able to stand the bad effects of grazing on wet, swampy land, and are very free from foot-rot and fluke. This breed is distinguished by thickness and length of head, a broad forehead with a tuft of wool upon it, a long thick neck and thick carcase. They are flat-sided, have the breast narrow and not deep, and the fore-quarter not heavy. They have a good quantity of internal fat, and are favourites with the butcher. They are hardy and will bear exposure well, They are largely bred in New Zealand, and can show a record for profit second to none. They are very suitable for heavy lands, and would thrive and do well where other breeds would die with foot-rot, and it is their hardy constitution which enables them to withstand the evil effects of wet land, and also to transmit this hardiness to their offspring.

Southdown Sheep.—This breed is one of the most popular for the quality of mutton, and is distinct in style and appearance. The head small and hornless and covered with wool, the face and legs black or brown, fine expression; the eye is large and mild, but full of life; ears small, breast wide, back perfectly level, legs short, ribs well-rounded, fine large carcase. The wool in some of the best sheep is soft, close, and elastic, fibre exceedingly fine; it is a medium wool between Lincolns and Merinos. Southdown rams put to Merino ewes give good lambs for an early market.

Hampshire Down Sheep owe their origin to County Hampshire. They are not nearly so symmetrical as the Southdown. They were previously a heavy-boned, ungainly-looking sheep, but have been improved of recent years. The leading points are: Large in the bone, large head, Roman nose, face and legs black, ears much larger than Southdown and more pointed. They make heavy weights at an early age. Yield of wool is small compared to size, from six to eight pounds. Both wool and mutton is of good quality.

Shropshire Down Sheep are a very popular breed at the present day, and are being largely used in all parts of the world. There are a large number in Western Australia, as well as in all the Australian States. They are largely used for crossing with the Merino ewe for early lambs. The leading points are: The face and legs of a soft black, well-developed head, clear and striking expression, no horns, body deep and squarely set on fore legs; wool is of a fine staple, splendid quality, short and close. They fatten very rapidly and produce excellent mutton. The ewes are good mothers, very prolific and hardy, and are remarkable for getting fat on coarse herbage.

Oxford Down Sheep.—This is quite a modern sheep, and was brought into existence by crossing the Hampshire and Cotswold breeds, and great judgment has been displayed in their production; they are now recognised as a distinct breed. They like a rich soil; they are a hardy breed, mature early, and produce excellent mutton of superior quality; the wool is close and fine; the ewes are excellent mothers and very prolific. Leading points are: Head small, tuft of wool on forehead, deep well-rounded body, usual black heads and face.

Suffolk Down Sheep are also recognised as a distinct breed and possess a flock book. They are supposed to be a cross between the old Norfolk breed and the Southdown. Leading points are: Hornless, face and legs black, clean white tuft of wool on forehead, ears black, eyes bright and prominent, shoulder broad, chest deep, ribs remarkably well sprung, full flanks, fine long level back. The wool is of good staple, fine, and without any tendency to mat; the skin is fine, soft, and remarkable for pink rosy colour.

Black-wool Merinos.—Mr. Allen, of Braeside, Queensland, has been breeding a flock of black Merinos. The wool of this flock has fetched a very high price. The breed is hardy and is very free from foot-rot.

Broad-tailed Sheep of Kurdistan are natives of Persia and well known on account of the size of the tail, which is very broad and equal to about one-third the weight of the body. The tail is a mass of fat, and serves as a reserve stock of food in time of drought. The rams have no horns. The lambs at birth are black, changing later on to long yellowish-white wool of the mature sheep. The value of this breed is for crossing with finer-wooled varieties, upon which the effect is marked. A number of the experimental stations in the United States have imported some of this breed for the purpose of crossing with their own sheep, and the results obtained have been very encouraging, and it is thought at these stations that the Persian sheep is destined to play an important part in the future history of sheep raising.

EXPERIMENTAL NOTES.

By Percy G. Wicken.

As the experimental work under this department is now increasing, it is the intention to supply, for the information of readers, a few notes each month on the results of the various plots. Experimental farms are now established at Bowes Siding, near Geraldton, and at Narrogin, on the Great Southern Railway. Most of the initial work on these farms is now completed, and during the coming season farm work will be conducted on a larger scale. Experimental plots, under the control of the department, have been established at Newcastle (Mr. V. Hamersley's), York (Mr. R. G. Burges, M.L.A.), Northam (Mr. J. French), and Mullalyup (Mr. J. Hawter). In addition to the above, there are plots under the control of the settler at Mount Barker (Mr. J. St. Jack), Gingin (Mr. A. W. Edgar), and Dardanup (Mr. F. Johnston). Arrangements have also been made by which Mr. Berthoud will continue the work at Hamel which has been carried out by him for several years past. Several other experimental plots are under consideration for the coming season, and will comprise several other districts, and settlers will then be able to see some of the new varieties of wheats growing, and also the results of the different manures, without the necessity of having to make a long journey. As harvesting will shortly be taking place, we shall be able from month to month to write up some of the results of these experimental plots.

The following report from Mr. A. Robinson, the working manager of the Narrogin farm, has been received:—

"About one mile of fencing has been completed, including 44 chains of rabbit-proof fencing (netting is let six inches into the the ground), surrounding the orchard block, consisting of 12 acres, which has been ploughed and sown with maize, three varieties of sorghum, two of millet, cow peas, preserving melons, water melons, rock melons, cucumbers, and pumpkins of different kinds. Thirteen acres have also been fallowed on the opposite side of the road.

"Crops.

"Owing to the continuous rains, the crops are not looking as well as they might.

"There are 62 varieties of wheat, oats, and barley. Of the wheats, the 67 crossbred is doing the best, a wheat which appears well adapted to this soil, having done remarkably well last year.

"Other varieties, which are doing well under the circumstances, are: Brodie's Prolific, Jade, Australian Talavera, and Medick. Of the oats, American Early Ripe is looking the best.

"Among the small experimental plots, Federation, White Tuscan, and Fill Bag wheats are promising very well.

"There are 33 different kinds of grasses planted out. The following are doing the best:—Prairie, Italian Rye Grass, Cocksfoot, and Paspalum Dilatatum. The latter, which was planted among some rocks, is looking far better than that planted in the sandy soil.

"Manure Plots.

No. 1.—Guano
„ 2.—Lime only } On a par.
„ 3.—Thomas' Phosphate
„ 4.—Bonedust.—Looks better
„ 5.—Superphosphate and Sul. of Ammonia.—About same as bonedust.
„ 6.—No manure.—Shows a contrast.
„ 7.—Superphospate.—On a par with guano.
„ 8.—Sul. of Ammonia.—Looking well.
„ 9.—Nitrate of Soda
„ 10.—Sul. of Potash } All looking well.
„ 11.—Sul. of Potash and Sul. of Ammonia
„ 12. { Superphospate
Potash
Ammonia } Doing best, but soil runs a bit better where they are sown.
Lime
„ 13.—Sul. of Potash

"The above plots are all sown with Barootа Wonder wheat and manured at a cost of 10s. per acre.

"The stock on farm are all looking well."

Remarks on Clearing.

"A good deal of heavy red gum timber had to be cleared off the line of fencing, and in doing this gelignite was found to be of great value. Some large red gums have been blown down with from four to eight plugs, costing at the rate of 1½d. a plug, or 6d. to 1s. per tree, which, if burnt down without the assistance of gelignite, would cost considerably more for labour; even if the gelignite does not bring the tree down it shatters the roots and trunk to such an extent that it makes them easy to burn.

"Into one large red gum (which measured 11 feet in circumference) a hole was bored to a depth of about 20 inches, into which were placed eight plugs of gelignite, which shattered the roots and trunk so completely that it will be no trouble to burn. It took 20 minutes to bore and charge the tree.

"If red gum country was treated in this manner and left for, say, 12 months, the trees would all die, and at the end it would come much cheaper to burn off. The saving in ringbarking would be some compensation towards the cost of explosives.

"Another great saving in clearing is the cross burning. For instance, when one has the tree down, to start chopping the trunk up into lengths to handle means considerable labour and time, whereas by cutting the sap through and placing a fire and a small log across the trunk at intervals, or in a fork, the fire will do the work. Then one has logs which can be handled and rolled together."

The Western Australian Producers' Co-operative Union, Limited.

The following report and balance-sheet by the Directors of the above Union have been received, and are of sufficient interest to warrant *their reproduction*:—

"It is now just twelve months since a start was made to form a Co-operative Union among the Producers of Western Australia. Practically, work was commenced in October last, and the Union is now in good working order. The result of the first year's effort has been exceedingly satisfactory, the Union being now of sound financial position with sufficient funds available to enable it to carry out the preliminary work anticipated.

"The number of shareholders enrolled is over one hundred, and the number of shares taken up and paid for to the end of the first financial year is just over 1,600, which number is expected to be largely increased before next season.

"The amount of business done was £2,300, and it is pleasing to note that after paying all expenses of running the Union a sufficient profit was made to pay off the whole of the preliminary and flotation expenses, with the exception of £50. The members' funds are therefore practically intact, which is an exceedingly satisfactory position, as, usually, in the formation of such concerns the preliminary expenses are considerable. The amount of profit to shareholders on purchases made through the Union at under ordinary market rates was £185, or equal to nearly one-half the amount paid for shares.

"The amount of business expected during the coming year is much greater than what was done in the past season, inasmuch as a large number of members did not join until after they had secured their requirements; and seeing that, taking it right through, the various fertilisers and things supplied have given satisfaction, both as regards quality and price, it is confidently hoped that every member will do his best to place his business in the hands of the Union for his next season's supplies.

"The Union has been successful in purchasing a certain quantity of Thomas's Phosphate and Superphosphate at a price which will enable them to be sold at £3 7s. 6d. and £4 9s. 6d., on trucks at Fremantle, respectively, during the coming season, provided prompt notification of the quantities required are sent forward.

"A great reduction in the price of fertilisers will be noted by members, and it is hoped that they will bear in mind that, although similar reductions are being made in other directions on last year's prices, the fact of having a Union working to reduce rates must be considerable on the general price charged throughout the State. Members should therefore do all in their power to keep the business of the Union as large as possible, and those producers who have not joined the Union should remember that whether they deal directly with it or not, the effect of the Union being in existence is greatly to their interests.

"It has been found that one of the chief difficulties in inducing producers to become members is the fact that some so-called Unions had been started shortly before which proved disastrous, and resulted in loss to the members of those concerns, whereas this Union is run on entirely different lines, and is purely co-operative. To this argument it might be pointed out that we have now had practically a twelve-month's run; that the business is in going order and likely to increase in the near future, and that, although the members receive considerable benefit in the shape of reduced prices, their funds are absolutely intact, and available for future operations. A further argument that is met with is that producers do not care to leave the firms with whom they have been dealing, and it would be well for these producers to bear in mind that there is absolutely no obligation on any member to deal exclusively with the Union, but if the Union can offer them advantages they are at liberty to partake of them, and in any case the very small amount for which the minimum number of shares can be taken up makes it well worth their while to become members, if only by having an active trading association formed for their protection. It is by no means the wish of the Directors to compete with existing merchants for business, the primary object being to enable members to secure their requirements at the lowest reasonable price at which they can be supplied, and to prevent the raising of rates on commodities which are necessary for successful work, and so long as merchants are supplying on such lines, the Union does not intend to actually compete with them.

"Arrangements are now being made by which the produce of members can be handled for sale in the Perth and goldfields markets, and members will be notified by circular in ample time for next season, as soon as the present negotiations are complete. It is therefore hoped that the Directors will have the hearty co-operation of all members in this direction, and that for their own protection members will refrain from committing themselves for the sale of their produce until they hear from the Union as to the arrangements proposed.

"Now that the Union has proved itself capable of continuing and increasing, it behoves every producer to make an effort to become a member whether he deals with the Union or not.—Yours faithfully, Charles Harper, Chairman."

THE WESTERN AUSTRALIAN PRODUCERS' CO-OPERATIVE UNION, LIMITED.

Balance-sheet at 30th June, 1903.

Liabilities.

	£ s. d.	£ s. d.	£ s. d.
Nominal Capital—£20,000 in 20,000 shares of £1 each			
Subscribed Capital—1,605 Shares at 5s.	401 5 0		
Less Allotment Fees Unpaid	4 15 0		
		396 10 0	
Bills Payable		318 7 5	
Sundry Crs.		326 14 10	
			1,041 12 3
			£1,041 12 3

Assets.

	£ s. d.	£ s. d.
By Sundry Drs.	295 12 9	
„ Cash at W.A. Bank	695 3 7	
		990 16 4
„ Profit and Loss Account		50 15 11
		£1,041 12 3

Trading Account.

Dr.	£ s. d.
June 30, 1903.	
To Sundry Accounts—Purchases	2,201 4 2
„ Profit and Loss Account	98 17 3
	£2,300 1 5

Cr.	£ s. d.
June 30, 1903.	
By Sundry Accounts—Sales	2,300 1 5
	£2,300 1 5

PROFIT AND LOSS ACCOUNT.

Dr.	£	s.	d.	£	s.	d.
June 30, 1903.						
To Printing and Advertising—Formation				38	13	6
„ Legal Expenses—Formation				36	13	6
„ Office Expenses—Stationery, Postages, Telegrams, Exchanges and Bank Charges—						
Formation	26	8	10			
Working	10	3	7	36	12	5
„ General Expenses—Formation	7	0	0			
Working	7	16	7	14	16	7
„ Salaries				25	0	0
				£151	16	0

Cr.	£	s.	d.	£	s.	d.
June 30, 1903.						
By Trading Account—Gross Profit	98	17	3			
„ Discount Account	2	2	10	101	0	1
„ Balance				50	15	11
				£151	16	0

I have examined the Books and Vouchers of the above Union up to the 30th June, 1903, and find this Balance-sheet to be in accordance therewith.

H. HOCKING, Auditor.

Perth, 4th July, 1903.

GOOD WORK OF THE LADYBIRD.

By T. HOOPER.

Mr. T. Hooper, the Chief Inspector under the Insect Pests Act, reports as follows:—

1. In March, 1901, at the National Show of Produce, the Department exhibited some oranges literally covered with the Mealy Bug (*Dactylopius adonidum*).

2. These were taken from a tree growing in a garden in the Mount's Bay Road, which was severely attacked by the pest, as also were the plantains growing in the same garden. The underpart of the leaves of these plants were covered.

3. Mr. Compere at the time pointed out what a serious pest this would become should it spread all over the State, and that it was at one time, before the introduction of the ladybird known as *Cryptolæmus Montrouzieri*, a serious pest in America.

4. Later on Mr. Compere sent over specimens of these ladybirds from New South Wales and Queensland, and they were liberated by me in the garden mentioned above.

5. Since then I have visited the garden and procured a colony of ladybirds for transmission to Northampton, and during various visits I have noticed the bug was steadily decreasing.

6. On September 7th last I again visited this garden to see if I could find any of the ladybirds, and I was pleased to get four adults and two larvæ, notwithstanding the early part of the season; but what was still more gratifying was to find the orange trees completely free of the mealy bug and the plantains cleaned to an extraordinary extent. The tops of the plants looked fresh and clean, with a few bugs on the under leaves and a few odd leaves rather badly affected.

7. I am of opinion that the mealy bug need no longer be considered a serious pest in this garden, and no doubt the little ladybird will soon be found at work all over Perth, and as far afield as there is food for it.

MANAGEMENT OF MANURES.

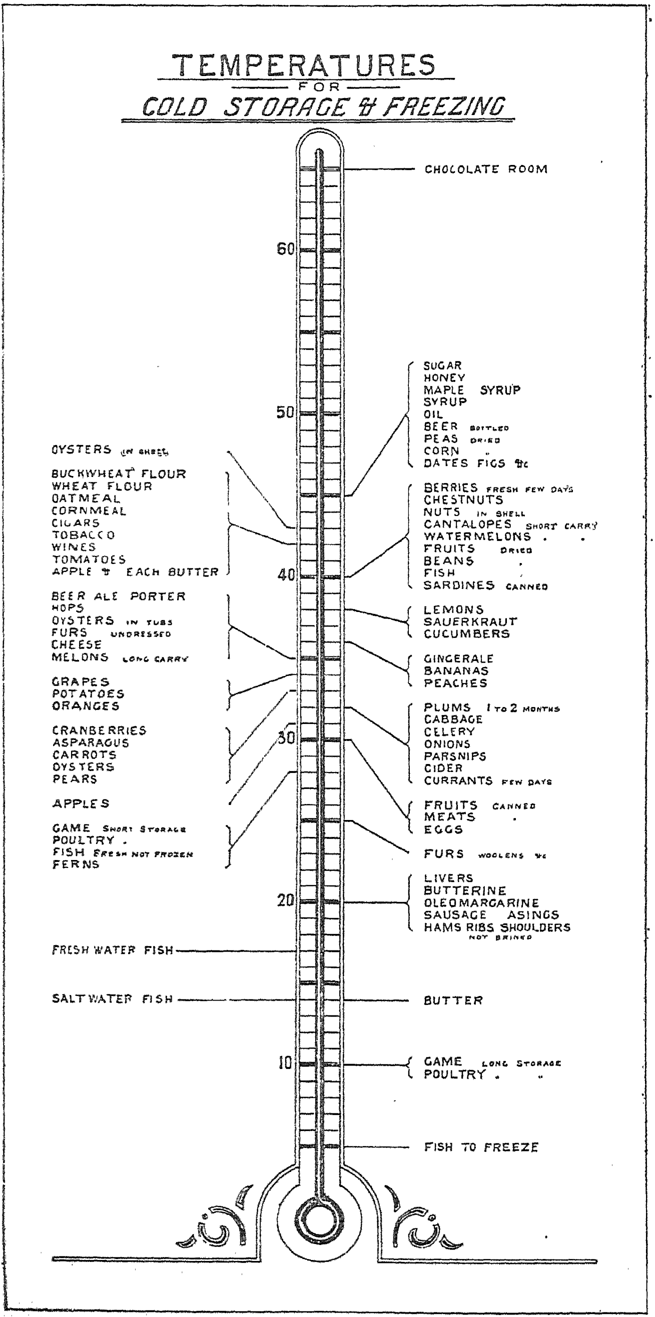
The farmer is often at a loss to know what fertilisers to mix with safety without deleterious chemical combination taking place. The following should not be mixed:—

Farm yard manure or dung with lime, or basic slag.
Nitrate with Thomas's Phosphate.
Nitrate with superphosphate.
Sulphate of ammonia with Thomas's Phosphate.
Superphosphate with slag.

Those that can be mixed with safety are as follows:—

Sulphate of ammonia with superphosphate.
Nitrate with bones.
Sulphate with bones.
Bones with slag.
Nitrate with phosphatic guano.
Sulphate with phosphatic guano.

At times some of the chemicals have a tendency to "set," *i.e.*, Nitrate of soda and kainit, and thus have to be powdered again to enable them to be sown. Rub and, as soon as mixed, apply to the land. Keep as dry as possible until then.—*Farmer and Stockbreeder.*



CENTIGRADE THERMOMETER.

LECTURES ON BACTERIA.

The Adelaide University Extension Course.

By Dr. E. Paget Thurstan, B.A., M.D. Cantab.

LECTURE I.

Bacteriology—Its History and Processes.

Ladies and Gentlemen,—Bacteriology (that is, the study of bacteria) is the youngest-born of the sciences, but the sturdy babe has thriven so wonderfully that in a very few years it promises to outbid all the others in importance.

Practically the science dates from Pasteur, Lister, and Koch—a Frenchman, an Englishman, and a German; men contemporary with most of us here. The knowledge of it has barely had time to permeate all classes and parts remote from the old centres of civilization, but its influence is truly wide-spread. It has its own literature, its magazines, its museums, laboratories, and institutes. Almost every trade has acquired new and valuable information from bacteriologists—especially some that deeply concern this State, such as wine-making, farming, and dairywork. Countless lives have already been saved by it, and they are as nothing to the possibilities of the future. Surgery has been profoundly modified by its influence. In its hands seems to lie the future medical treatment of many diseases now only curable by that sharp remedy, the surgeon's knife.

It is a very difficult task to so shape these lectures as to avoid all technicalities. Sciences are interwoven to such a degree that it is difficult to understand any one of them without some knowledge of the others. Some of my hearers are, possibly, unacquainted with any of the sciences; moreover, it is plainly impossible to teach a science in the course of three lectures. I propose, therefore, to use as few technical terms as possible, and explain these in the simplest phrases at my command. Though I cannot make you all accomplished bacteriologists, I can enable you to acquire a comprehension of facts of the deepest importance to every member of the community, as I am sure you will allow, if you have the patience to follow me through the course. I take it, the object of these series of lectures is educatory, not merely interesting. Education (from *educo*, I bring forth) means a bringing out of the faculties—thought, reflection, reasoning, deduction, comparison. All these I hope to stimulate by the story I have to tell. A few big foreign-sounding words you must be prepared to hear. Do not misunderstand them, like the untravelled Englishman, who, hearing a Frenchman exclaim "Comment!" took it for a challenge, replied "Come on," and promptly struck the first blow.

For many centuries observers were acquainted only with such objects as are visible to the "naked eye." So little did people travel that they were sceptical about many things that are familiar enough now. The Romans had a proverb about rare things being like a black swan, though there were plenty of black swans in the world then if they had only known it. It was next to impossible for stay-at-home people to discriminate between true tales and the de Rougemontesque of travellers. You remember the well-worn story of the old mother who believed her sailor son's account of the rivers of rum and mountains of tobacco, of the wheels of Pharaoh's chariot that the anchor brought up in the Red sea, but could not swallow the tale of fish that flew. When the invention of the telescope enabled men to realise that the universe consisted of tens of thousands of worlds, many far bigger than this, and flashing suns beside which ours was a pigmy, it certainly widened the human outlook. But this in no way prepared people to realise that the earth contained, besides all the plants and animals, countless billions of minute organisms which occupied the air we breathe, the water we drink, the substance of every body, the soil of the field and garden, and the dust of the city, and yet had for centuries been hidden from our view.

More than two hundred years ago a Dutch draper named Leeuenhoek amused his leisure by grinding lenses, which were practically the beginning of modern microscopes. By the aid of his new instrument he was able to see what no human eye had ever gazed on before. It was like Columbus looking at America. You can picture his amazement and delight. From that time the microscope has undergone continuous improvement, until now it can magnify nearly 2,000 times. A tiny thing one micro-millimetre long—that is, only the one twenty-five thousandth part of an inch, when magnified a thousand times seems as if it were the twenty-fifth of an inch in length. Now a man can divide an inch into twenty-fifths with his hand without the aid of any instrument, and see the spaces between the lines without the help of a magnifying glass, so the inconceivably little has become plainly visible. You must try and realise how small these dimensions are, or you will be unable to grasp one of the cardinal points of bacteriology. If each bacterium was one twenty-five thousandth of an inch long (and the influenza bacillus, for instance, is far smaller than this) then in a drop one twenty-fifth of an inch across, hanging we will suppose from the point of a needle, there would be a thousand germs *in each diameter*, and the whole drop would contain more than 500,000,000—a hundred and thirty times the population of all Australasia, say in one tiny drop.

What did the workers with the wonderous magnifying lenses see? In almost everything Leeuenhoek examined he saw little shapes, many of them darting about in various directions—very much alive apparently. Can you wonder that these minute organisms were mistaken for animalculæ? Now, however, we believe that they are plants not animals, though popularly they are spoken of still as if they were alive, just as we speak of the sun rising and setting, though we are satisfied it does nothing of the kind. All these little bodies are called generically "bacteria." Different writers classify them in various ways, but usually there are recognised three main divisions, arranged according to the *shape of the bacteria.* The first class is named "bacilli," from *bacillus*—a rod. Some bacilli are relatively thin, others are almost as broad as they are long, but still distinctly longer one way than the other. We will now show you on the screen some samples (Fig. I.)

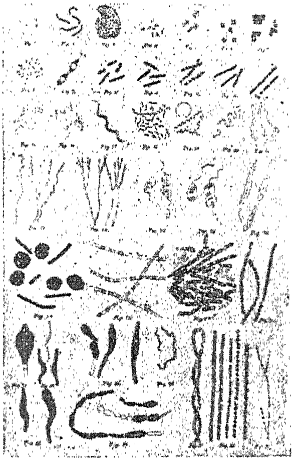


Fig. I.—Various shapes of Bacteria.

Each division has numberless sub-divisions. Very often, especially when the little organisms cause illness when gaining access to a living being, it is named after the disease it produces, as the "Bacillus Anthracis," the bacillus of *Anthrax* or woolsorters' disease. The next class is known as "Cocci," from *coccus*, a kernel—plural cocci. They are like minute balls, or so many tiny eggs. These are frequently named after the manner in which the little individual globes are grouped together. When these are arranged in pairs they are called "diplococci;" when three or four are strung together in chains they are called "streptococci" from *strepton*, a chain; when in bunches like grapes they are "staphylococci," from *staphule*, a bunch of grapes. Sometimes they too get their name from the disease they cause, as "pneumo-coccus, the coccus of pneumonia. The bacilli multiply by spores or seeds which form inside of them. The cocci increase by dividing into two. Possibly the diplococci or cocci in pairs, and the streptococci in chains, are really cocci in process of sub-division. Anyway, you will seldom find all your cocci of one pattern. There is a species called "Sarcina," or the woolpack, which is arranged in cubes two long, two broad, and two deep—eight together. The bacilli often have fine filaments at one end or both, known as "flagellæ" or "whips"; the cocci do not have these flagellæ. The third group is known as "spirilla"—spiral or corkscrew like, with a spiral movement. These multiply by spores and not by division; that is as far as the microscope can take us. The early observers were so eager in searching for new forms that they overlooked any other possible means of identifying them, and we come down to quite recent times before we get any satisfaction. Before going on to describe the processes now adopted I will give you a slight historical sketch, which will, I think, be interesting, and at the same time will lead you gradually up to the modern standpoint.

Quite a host of theories were advanced and disproved in course of time. In following up or opposing these, observers hit upon one fact after another which gradually fitted together and made the mosaic complete. One of the first puzzles to early observers was: "How came these micro-organisms there?" Many asserted that, seeing how impossible it was to exclude them, they must hatch out of themselves, that there must be *spontaneous* generation. Others asserted that out of nothing nothing came, and that there must be some original germ which produced the others.

In 1776 an Italian named Spallanzani claimed to have solved this problem. He boiled liquids such as broth, which under ordinary circumstances readily decomposed, in a glass flask, and sealed up the end while the contents were boiling. As a rule no life appeared in the liquid even when kept for months. Sometimes, however, notwithstanding his care, the contents of his flask went bad. This failure we now explain by supposing that in these cases Spallanzani had bacilli or spirillæ as well as cocci in his flask. While the boiling heat destroyed the germs it did not destroy the spores of the bacilli, and later on these fructified. However, in those days, nothing was known of the existence of spores, and consequently no explanation was forthcoming. Still, it could not be denied that in some cases these ubiquitous germs could be excluded—if so they did not hatch out of themselves in the broth. But the opponents of spontaneous generation refused to be convinced. They pleaded that germs must have oxygen to live just as we do ourselves; and sealing the flask, said they, if it did not actually exclude oxygen at all events very markedly limited it. Sixty long years passed before even one more step forwards was taken. In 1836 an experiment was conducted wherein air was continuously passed to the boiled liquid in the flask, but to get there it had to pass through concentrated sulphuric acid, after which it was strongly heated. Then no growth occurred in the *bouillon*. This proved that in Spallanzani's historical experiment it was not want of oxygen that had prevented the breeding of bacteria. But, urged objectors, in this experiment such chemical change must have taken place in the air as to render it impossible for germs to live in it. This new objection remained unanswered for eighteen years, but at last two ingenious experimenters, Schröder and Von Dusch settled the question for all time. They passed the air to the liquid through a filter of cotton wool. There was no intense heat to calcine the air—no chemical to spoil its nature. It was evident that there was a something in the air which cotton wool could mechanically filter out, which caused putrifaction, and that without this something no life appeared. This finally crushed the spontaneous generation theory. At the same time it established a new fact that all putrefaction was due to germs floating everywhere in the air. In the course of this long struggle the experimenters had hit upon many stray facts useful to this day—for instance, to this hour we plug flasks and test tubes with cotton-wool to exclude germs. Indeed, Spallanzani's original experiment with the sealed flask was the direct ancestor of the art of tinning foods, which in its day, before the cold storage process had been invented, did so much for Australian prosperity. We now come to the discoveries of Pasteur. He carried the cotton-wool proof a step further, for by heating the neck of the flask, drawing it out fine and bending it over he succeeded in dispensing with even the cotton-wool filter. It was he too who first advanced the theory of spores, and thus explained the occasional failures of Spallanzani. His notion was that the temperature of boiling point was fatal to germs but not to spores. With the idea of proving his theory he boiled his *bouillon* and stood it on one side. In a day or two, when he thought the spores had had time to develop into bacilli he boiled the liquid again. Even twice boiling did not always absolutely sterilise his broth. Some spores were evidently more backward in developing than others. A third boiling proved quite effectual. At the present time there are observers who assert that though the process was successful the theory was wrong, and that the real explanation is that alternate boiling and cooling is more injurious to bacteria and their spores than keeping at the boiling point continuously for even an hour. For my part this theory that some of the seeds of bacteria germinate later than others seems exactly analogous to what happens among the visible plants and trees. It is a well-known fact that when a bush fire sweeps through a forest trees spring up of a different kind to those that were destroyed. The idea is that the ground is full of seeds that keep their vitality for very many years, but never have a chance to germinate. The fire roasts the seeds to a depth of three or four inches, and then those below are free to spring up at the invitation of the first shower. I remember once seeing a wheat field on a hill so thickly grown with poppies that it looked like a scarlet blaze a long way off. I was told that for many years this meadow had been used as pasture land, but that when long before it had been a wheatfield it had been remarkable for its growth of poppies. It seemed evident that the poppy seeds had lain dormant all the while to come to life again as soon as the field was ploughed. When a putrescible liquid is rendered absolutely free from germs it is spoken of as *sterile*. To show how imperative it is to destroy all life I have drawn up a chart which I show you. Supposing a germ can double itself in an hour—and many can do it in much less—then we have a simple arithmetical task to find out how many there will be in 24 hours. It is the old joke of the horse shoes to be paid for at one farthing the first nail and double as much for the next one, and so one through the series. In this way the unfortunate owner had to pay £34 for having his horse shod. The chart on the wall shows that if you left a single germ in your *bouillon*, the next day you would have nearly 17 million of them. Of course as they multiplied food would become scarcer, and their rate of increase would gradually dwindle. In my third lecture, however, I shall give you an actual example, of which I now show the chart, in which they were counted from hour to hour, when 3,000 germs per c.c. (twenty drops) reached in 24 hours, under favourable circumstances, 577,000,000. The fact that spores can resist boiling heat is perhaps not so remarkable as that the very germs which succumb to that heat can withstand any degree of cold that can be applied. When the Fahrenheit thermometer, which we English still use in our intense conservatism, was invented, it was supposed that zero represented absolute cold—that is, −32° or 32° below freezing. Now we are practically certain that −273° is the point which represents no heat at all. Professor Dewar has, within the last few years, succeeded in liquifying all the gases except one called Helion. Each gas when liquified has enabled the experimenter to secure a greater degree of cold and so liquify another. Liquid air you have all heard of—we live in hopes of utilising it as a motive power. Its temperature is only −168°, but the Professor has got down to −260° to −263°. In his presidential address to the British Association at Belfast last September, Professor James Dewar thus described his experience with germs under this intense cold:—"These (typical) germs were exposed to the temperature of liquid air for 20 hours, but their vitality was not affected. The same result was obtained when liquid hydrogen (−252°) was substituted for air. A similar persistence of life in *seeds* has been demonstrated even at the lowest temperatures; they were frozen in liquid air for over 100 hours with no other result than to affect their protoplasm with a certain inertness. Subsequently commercial samples of barley, pea, vegetable marrow, and mustard seeds were literally steeped for six hours in liquid hydrogen, yet when sown by Sir Thiselton Dyer at Kew the proportion in which germination occurred was no less than in other batches of the same seed which had suffered no abnormal treatment." After this we may well ask, What is life? Certainly not chemical action, for all such ceases at these low temperatures. Bacteria are as indifferent to pressure as to cold. Dr. Krause submitted typhoid, anthrax, and tubercle bacilli to a pressure of 500 atmospheres, or 7,500lbs. to the square inch, and they emerged with virulence unimpaired. Nor does prolonged drying through a long summer make them die of thirst. They are a hardy folk.

The progress that bacteriology made under Pasteur's fostering genius was amazing. The story of some of his discoveries reads like a romance. The silkworm industry of France was threatened with destruction owing to the devastating ravages of a disease called *Pébrine*. Pasteur studied the matter carefully, and came to the conclusion that the very eggs contained the germ of the ailment. He kept moths separate from one another; as soon as the egg laying was finished he crushed the body of the moth and examined a drop of the juice under a microscope. Whenever he discovered the germ in the mother he found that later on the worms that hatched out from its eggs became infected with the disease. Practical results quickly followed. Girls were established at each factory with microscopes. Every moth was kept separate and carefully examined. Only the eggs of healthy mothers were kept, and the rest were burned. As Mr. Micawber would have put it, "Result, happiness!"

So much for the history of the microscopical work, but that alone was insufficient. The problem was how to separate the various species, crowded together as they were in such millions, and study them apart? It was Koch, the famous German savant who accomplished this part of the work. I have already pointed out to you that mathematics teaches us that one tiny drop of fluid might contain between five and six hundred millions of germs. It was hardly likely that such incredible numbers should all be of one species, but how were they to be subdivided by five hundred million? This was the method Koch adopted, which stands to-day as the approved plan. Different germs flourish best, or only in some special culture medium—the one most used is meat broth, or peptone. Gelatine is a material which can be combined with the nutrient medium, and is added because it can be rendered liquid by gentle heat, such as is injurious to very few germs, and yet is solid at the ordinary temperature of a room. Gelatines slightly vary in their melting points, according to their source. It would make you shudder were I to tell you all the sources from which the gelatine of the shops is derived, but I will spare your feelings. Calves' feet jelly is regarded by us as a delicacy; it is just gelatine, but so is the birds' nest soup of the Chinaman and the Frenchman's frog. A certain Japanese seaweed known as agar-agar gave a particularly suitable form of gelatine, which did not melt too readily, and was largely used in these experiments. Having prepared his "nutrient agar-agar" as the combination of bouillon and gelatine was called, Koch warmed some, and as soon as it was melted, poured it into two or three test tubes. Every precaution was taken to be sure it was sterile to begin with. Then some germs were added to one of the tubes by dipping a fine platinum needle in a suspected liquid, or lightly scraping a suspected solid with a sterilised platinum loop. However gingerly the operation was performed there were sure to be thousands and possibly millions of germs transferred to the test-tube. These were well stirred in, and then a drop from the first tube was inserted into a second and stirred up. A drop from that was used to inoculate a third tube. In this way the original germs have been diluted, say, to one-thousandth of one-thousandth of one-thousandth of their original number. The material from the third tube is poured on to a glass plate, and put to develop in a special chamber (Fig. II.).

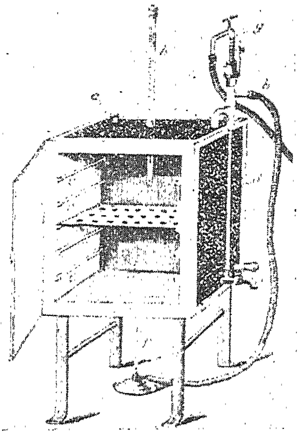


Fig. II.—Incubating Machine.

Probably there would not be more than five or six germs on the plate. Each feeds on the nutrient material and rapidly multiplies, so that colonies form, each derived from a single parent and therefore all of the same species. Koch was soon able to lay down certain conditions that must be fulfilled before any experiments could claim to have identified a germ. After finding a germ associated with a particular disease (for instance), it must be isolated in the way I have described. When a pure culture has been obtained, any animal inoculated with that germ in such a way as to exclude all other bacteria, must show the original symptoms, and the germ must be once more isolated from its tissues. As far back as 1849 the germs of anthrax were detected in the blood, but it was then impossible to separate them or to prove that they were the sole cause of the disease. This shows the vital importance of the process Koch devised, simple as it seems. It is only 23 years ago that he discovered the germ of typhoid fever, the first of a series, the last of which, the discovery of the germ of bubonic plague, was made only nine years ago. This was the work of Kitasato, a great Japanese investigator. Europeans will have to look to their laurels.

The foregoing sketch of the history of our science will have done a good deal, I hope, towards enabling you to understand the brief description of the processes whereby bacteriologists do their work, which I now propose to give you.

The system is practically that recommended by Koch. One of the first things noticeable about germs is that some can only live in some host, that is, to use a botanical phrase, they are *parasites*. A parasite is an organism which does not elaborate its nourishment for itself, but takes it ready made from another. Some bacteria are strictly parasitic, that is always so. When they invade a person he has to support them, whether he likes it or no, like a rich man with poor relations who insist on sponging on him, instead of earning their own living. Those germs which are not parasites are called saprophytes. Some are not strictly parasitic, but have the *faculty* of being so (*facultative* parasites). Again, there is a very broad distinction to be drawn between two classes, one of which can only live in the presence of air, as we ourselves do: these are called aërobic. Others can only live where there is little or no air—anaërobic. Some bacteria have the power of liquifying solid gelatine; others have not. These are called respectively liquefying and non-liquefying. Some have free powers of movement, others have none—motile and non-motile. You would be surprised at the lovely colours that are developed when certain germs are cultivated. This, again, is used as a means of discriminating. There are milk-white, lemon-yellow, golden, scarlet, purple, and so on. These are called chromogenes—colour bearers. Others are aërogenes or gas generators, or zymogenes—ferment formers. We have the power of forming ferments inside us, one of which digests meat, and another changes starch into sugar. Various fruits and vegetable substances also possess this power. The Papaw fruit is rubbed over freshly-killed meat in the West Indies to render it tender. Another means used for discriminating between different germs is their size. By way of forming a standard we speak of bacteria as a fraction or multiple of a micromillimetre, this being the 1-2500th of an inch. In writing of this, we use the Greek letter mu (μ) as equal to one micromillimetre. An ingenious machine has been invented for counting the germs present. A piece of glass in a frame is divided by lines and cross lines by cuts with a diamond, each, say, a quarter of an inch apart, or a millimetre, that is 1-25th of an inch, apart. By counting the number in one division and multiplying out we get the total in any given area. Even with a high-power microscope it would not be easy to recognise bacteria were it not for an ingenious process known as *staining*. It is found that both germs and the tissues they lie in vary in the readiness with which they become coloured by dyes. It is also possible to take out the stains after they have been put in. Here, again, different structures vary in the readiness with which they part with their colour. Advantage has been taken of these properties to get the several parts of a preparation differently stained and thus get the benefit of contrast. The colours used are known as aniline dyes, all got out of that wonderful Pandora's box, coal-tar. A surprising number of shades can be obtained from this source nowadays. All the thousand and one tints of ladies' dresses, for instance, are derived from the gas-works. Vegetable dyes will soon be a thing of the past. The only colouring which has resisted the march of modern progressive discovery is the red of the British soldier's uniform. This is still dyed with cochineal, as that stands the weather better than anything else. The principal staining agents used by microscopists are

Fuschin, Methylene Blue, and Gentian Violet. In order to keep well the colours are preserved in strong alcoholic solutions, and diluted when wanted. Most of you, doubtless, know the strips of glass called slides that are used for microscopical work, with the very thin circles or squares of glass known as cover slips, to put on that part of the slide where the object is. With great care, to prevent too many germs appearing, a minute portion is smeared on the slide (known technically as a "smear"), which is dried by passing lightly through the flame of a spirit lamp. A drop or two of staining fluid is let fall on it, and warmed in the spirit flame for a few seconds to hasten the process. Different stains need various times—fuschin only requires a few seconds. Our smear consists of the albuminous material of the animal containing the bacteria, and these themselves consist of two parts, a cell wall, and inside that a spore, perhaps. If the staining is too deep we "cannot see the trees for the wood," as the quaint old phrase has it. We therefore take away the stain from the albuminous material by washing it in alcohol, leaving it in the bacteria. Sometimes we stain the general substance a reddish colour with eosine or vesuvin, so as to have red on blue. With a lens whose focus is only 1-12th of an inch there is barely room for the thinnest cover slip, and to protect the lens from being scratched we put a drop of cedar oil on the slip and plunge the object glass in that. Hence it is often called an "oil-immersion lens." Altogether a microscope is a costly toy. There is an apparatus for throwing microscopical subjects direct on to a magic lantern, but it is very expensive and there is not one in the State. We must wait till we can grow Carnegies here before we can afford such luxuries. Having decided whether we have bacteria present, and whether they are bacilli, cocci, or spirillæ, we now pass on to cultures for further information. Bear in mind what incredible numbers may be present, and how difficult it is to prevent other germs floating in the air or on the apparatus from gaining access to the specimen from which you wish to isolate some particular bacterium. It is very hard to realise, I know, but it is the essence of bacteriology. By the most scrupulous, almost fidgetty, attention to detail, the modern surgeon has successful results in daring operations, at which his predecessors in the profession would have stood aghast. You remember what I told you of Koch's work? This is still the process of the day. You sterilise nutrient agar-agar or gelatine; you dilute and re-dilute your material in test tubes of this; you pour the last dilution on to a glass plate and put it aside in a culture chamber kept at a regulated heat, like an incubator, for a day or several days, as the case may be. When colonies are seen with the naked eye, a minute portion is fished out with a platinum needle and examined under the microscope. One or the other of the colonies on one of your plates is almost sure to consist of the germ you are searching for. From that you can inocculate fresh nutrient gelatine and get a pure culture. Besides this culture test, there are others. Prepare several tubes of gelatine and let them solidify. Dip a platinum needle into the colony and plunge it into the solid gelatine to the depth of an inch or more. Seal up the test tube with cotton wool, just as Schrœder and Von Dusch did over half a century ago. This is called, technically, "a stab." There are several things to be learned from it. I will now show you a picture of some stab cultures (Figs. III. and IV.).

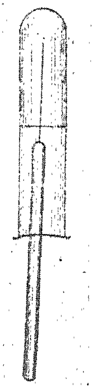


Fig. III.—Platinum Needle inserted into a tube of gelatine.

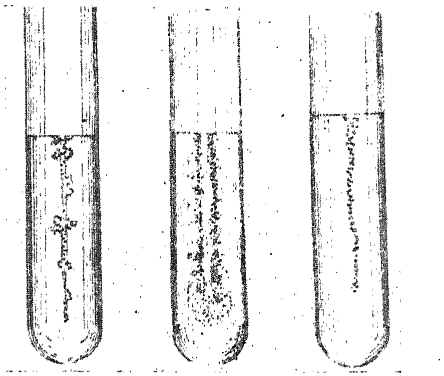


Fig. IV.—Stab Culures.

The channel made by a fine needle plunged into gelatine is so small that air will hardly go down it. At the very bottom of the burrow may be one or two germs almost smothered in gelatine and excluded from air perhaps entirely. You remember I told you that some germs will only live in air, and others only when the atmosphere is excluded. By observing whether most growth takes place at the upper part of the stab or the lower, or whether *exclusively* at the bottom of the puncture hole, or on the top, you know whether your bacteria are aërobic or anaërobic. You can also observe whether the gelatine becomes liquified or not—whether colours form or gas is given off. If very little growth takes place at the very lowest part of the stab it may be necessary to pour a little liquid gelatine on the top of the solid to seal up the puncture and more completely exclude the air. Sometimes bacteria will not do well on nutrient gelatine, but flourish on some solid medium such as potatoes, carrots, turnips, and bread. Some animal fluids, such as milk and blood serum, are also used. In my succeeding lectures you will hear a good deal about milk which will convince you that it is a first-class medium in which to cultivate germs. If potatoes are to be used, they are thoroughly washed and cooked in their jackets. They are cut open by a carefully sterilised knife—even the hands are washed before touching the potato. When the tuber is sliced through it is not opened out until it is in the damp chamber. A minute scraping from the tissue is spread on one half. To dilute it, a little from this is spread on the second half potato and some from that on a third, and the last one is set to develop in a culture chamber.

To completely fulfil Koch's conditions, it is necessary, after having obtained a pure culture, to inoculate an animal with them to ascertain whether they multiply, and also reproduce the original train of symptoms. Then the germ must again be isolated from the second animal.

We have now traced the whole process through. I fear some of it may have been a little dry, but it is impossible to acquire any knowledge worth having without some little effort. Now that you have mastered the principles on which bacteriologists work, you will be able to appreciate what I have to tell you in the subsequent lectures. In my next one I shall, I hope, convince you that there is a great deal of money to be made by the practical applications that have been made from the investigations of the great pioneers. In my last lecture I shall deal with big questions of public health—how lives depend on the knowledge our rulers may happen to possess on this subject. Everywhere, and in every path of life, we can make bacteria our most useful servants. Like the Trölls of ancient Norway, they will work for us while we sleep. Like every other force, they are very bad masters.

Ladies and gentlemen, this is the great and coming study of the day. It is not possible for many of us to go deeply into the subject, but it behoves us all to take the pains necessary to grasp the principles involved, seeing that sanitation, healthy homes, personal hygiene, a low death rate, the avoidance of preventable disease, legislation against infection, quarantine, and even profitable trade, all are bound up in the questions that bacteriology is called upon to solve.

A wise Persian philosopher has thus defined the grades of knowledge :—(1.) He who knows not, and knows not that he knows not. This is crass ignorance. (2.) He who knows not, but knows he knows not. This is a class we all belong to in some things. (3.) He who knows, but knows not that he knows. This is vague knowledge. (4.) He who knows and knows that he knows. This is thorough knowledge. I hope I have enabled each of my hearers at least to advance from one to another of these divisions.

I thank you for your patient attendance.

(*To be continued.*)

ANNUAL SHOWS.

During the past month agricultural shows have been held in many of the country districts. Owing to the neglect of secretaries of shows in not sending in particulars, we are under an obligation to the daily Press for a report of the prize lists.

GERALDTON SHOW.

The annual show was opened at Geraldton on the 29th of last month, and was, without doubt, so far as we can learn, the most successful yet held in that district. Appended is the prize list.

DRAUGHT HORSES.

Stallion (open class): Teakle Bros. "Governor," 1; Clarkson's "Rendlesham Earl," 2. Stallion (Western Australian bred): T. Cream, 1; M. Devlin, 2. Mare (open class): T. Cream, 1; D. Duncan, 2. Mare, any age (Western Australian bred): W. Devlin, 1; D. Duncan, 2. Brood mare: T. Cream, 1. Pair of farm horses: D. Duncan, 1 and 2. Colt (three years or under): Teakle Bros. "Governor," 1; Newmarracarra's "Craig's Pride," 2. Filly (three years or under): F. Devlin, 1. Champion prize stallion: Teakle Bros. "Governor," 1. Champion prize mare: T. Cream's "Duchess," 1.

BLOOD STOCK.

Mare (open class): Newmarracarra's "Snowdrop," 1. Brood mare: Newmarracarra's "Special Reserve," 1 and champion prize. Pony stallion (open class): Newmarracarra's "Dawson," 1; W. Jose, 2. Pony mare: Newmarracarra, 1; C. Conway, 2.

CATTLE.

Bull (open class): A. W. Edgar's "Favourite Royal," 1. Bull (over one year and under two years): A. W. Edgar's "Strathalbyn Monarch," 1. Champion prize (bull under 12 months): Newmarracarra Estate, 1; Newmarracarra's "Lindenow Duke," 2. Cow (three years or over): Newmarracarra, 1 and 2. Heifer (over two years and under three years): Edgar's "Strathalbyn Lilly," 1. Heifer (over one year and under two years): Edgar, 1; Newmarracarra, 2. Heifer (under 12 months): Edgar's "Strathalbyn Josephine," 1; Edgar, 2. Champion prize: Edgar's "Strathalbyn Mary." Dexter Kerry bull: A. Crawford, 1. Dexter Kerry cow: A. Crawford, 1. Jersey bull: Morrell, 1. Jersey cow: Teakle Bros., 1. Dairy cow: Mrs. Tulley, 1. Two fat cows: Newmarracarra, 1.

SHEEP.

Ram (open class): Newmarracarra's "Federation," 1; Sandspring's "Shakespeare," 2. Teg ram: Sandspring, 1; Newmarracarra, 2. Ewe (two years or over): Sandspring's "Foam Bell," 1 and champion; Newmarracarra, 2. Teg ewe: Newmarracarra, 1 and 2. Merino ram and two progeny: Newmarracarra's "Glengarry," 1 and champion; Sandspring's "Neptune," 2. Ram (Western Australian bred, two years or over): Bowes Estate, 1 and 2. Teg ram (Western Australian bred): Newmarracarra, 1; Bowes, 2. Ewe (two years or over): Newmarracarra, 1; Sandspring's 2. Teg ewe (Western Australian bred): Newmarracarra, 1; Sandspring, 2. Five merino ewes: Newmarracarra, 1. Merino ram (property of the owner of not more than 3,000 sheep): G. E. Sewell, 1. Shropshire ram: S. Jupp, 2. Five fat wethers; Bowes Estate, 1.

NORTHAM SHOW.

The Fifteenth Annual Show of the Northam Agricultural Society was opened on Tuesday, the 6th, and continued the following day. Notwithstanding the unseasonable weather the exhibits this year were even better than at any previous show. The following is the prize list:—

BLOOD STOCK.

Thoroughbred entire: W. G. Leeder's "Tremando," 23 years, 1; Miss Maud Dempster's "Flintlock," 2. Thoroughbred mare, in foal: Miss Maud Dempster's "Maoriland," 1; T. B. Wilding's "Essie," 2. Thoroughbred mare: Miss Maud Dempster's "Maoriland," 1; H. Wilding's "Essie," 2. Roadster entire: Miss Maud Dempster's "Commonwealth," 1; H. F. Throssell's "Kinrara," 2. Roadster mare, in foal: T. H. Wilding's "Juno," 1; Miss Maud Dempster's "My Lady," 2. Yearling colt: Miss Maud Dempster's "Oakul," 1; A. C. McCorry's "Never Fail," 2. Yearling filly: W. P. Dempster's "Starling." Best foal, by "Kinrara": T. H. Wilding. Draught horses (imported or colonial-bred): H. T. Smith's "Cardinal," 1; J. Snook's "Western Hero," 2; E. Viveashe's "Maori Chief," 3. Three-year-old entire: Henry Wills & Cos. "Prince Albert," 1; A. G. Loton's "Revenue," 2. Draught mare: H. F. Throssell's "Gypsy," 1; T. H. Wilding's "Magnet," 2. Mare, visibly in foal: H. F. Throssell's "Gypsy," 1; T. H. Wilding's "Magnet" 2. Four-horse team: H. Teesdale Smith. Two-horse team: H. Teesdale Smith, 1; H. W. Hancock, 2. Pair of farm geldings: Miss Maud Dempster, 2 (no first). Pair of farm mares: H. Teesdale Smith, 1; Miss Maud Dempster, 2.

W.A. BRED DRAUGHT STOCK.

Entire: Sermon Bros.' "Pride of Valley." Mare, visibly in foal: T. H. Wilding's "Magnet," 1; Miss Maud Dempster's "Miss Madge," 2. Draught mare: T. H. Wilding's "Magnet," 1; Miss Maud Dempster's "Miss Madge," 2. Yearling filly: T. H. Wilding's "Deborah," 1; S. F. Throssell's "Juno," 2. Two-year-old colt: W. P. Dempster, 2. Two-year-old filly: Miss Maud Dempster's "Kate," 1; T. H. Wilding's "Judy," 2. Three-year-old filly: Miss Maud Dempster's "Miss Madge," 1; T. H. Wilding's "Caloe," 2. Hacks—Maiden hunters: J. R. Cooper's "Botany" (J. Shannon), 1; T. Brooks's "Comet" (Brooks), 2. Tradesman's turnout: J. Anderson, 1. High jump: H. Withnell's "Ginger Kelly," 1. Carriage horse (15·2 or over): C. A. Sweeting's "Dosey," 1; H. Hummerston's "Miss Petersen," 2. Pony jumper: H. Withnell's "Ginger," 1.

HORNED CATTLE.

Jersey or Alderney bull: H. F. Throssell's "Red Ribbon," 1; F. R. Walsh's "Silver," 2. Jersey or Alderney cow: H. F. Throssell's "Honey Bee," 2; F. R. Walsh's "Milkmaid," 3. Ayreshire bull: Miss Maud Dempster, 1. Ayreshire cow; Miss Maud Dempster's "Dolly," 1; Miss Maud Dempster's "Princess May," 2. Ayreshire heifer: Miss Maud Dempster, 1; A. G. Loton, 2. Jersey heifer: H. F. Throssell's "Cream Dish," 1; T. H. Wilding, 2. Jersey bull: P. Kilgallon, 1. Shorthorn bull: A. W. Edgar's "Lindenon," 1; A. G. Loton's "Gladiator," 2. Shorthorn cow: A. W. Edgar's "Miss Matilda," 1; A. G. Loton's "Gap Princess," 2. Shorthorn heifer (under 18 months): A. W. Edgar's "Strathalbyn Gift," 2, T. W. Wilding, 3. Fat beast (W.A. bred): F. Rewell, 1; T. H. Wilding, 2.

SHEEP.

Merino rams: H. Wills and Co., 1; A. G. Loton, 2. Ewe: Miss Maud Dempster, 1; A. G. Loton, 2. Lincoln ram: Marwick Bros., 1 and 2. Ewe: Marwick Bros., 1 and 2. Shropshire ram: Marwick Bros., 1; H. Wills and Co., 2; Ewe: H. W. Hancock, 1 and 2. Five fat merino wethers: T. S. Wilding, 1. Five fat wethers: T. H. Wilding, 1 and 2. Five fat lambs:

T. S. Wilding, 1 and 2. Sheep (W.A. bred)—Merino ram: T. H. Wilding, 1; A. G. Loton, 2. Ewe: A. G. Loton, 1 and 2. Merino ewe (one year and a half or under): T. H. Wilding, 1.

POULTRY.

Langshan cock or cockerel: W. F. Smythe, 1. Langshan hen or pullet, W. F. Smythe, 1 and 2. British Game, black-red cock or cockerel: F. Rewell, 1; Jas. Fagan, 2. Black-red hen or pullet: Jas. Fagan, 1; W. J. Smythe, 2. Malay (any colour), cock or cockerel: G. Freese, 1; Jas. Fagan, 2. Hen or pullet: J. Freese, 1; L. P. Dailly, 2. Australian Game (any colour), cock or cockerel: J. Freese. 1. Indian Game: Hen or pullet: B. Glasson, 1; W. J. Smythe, 2. Dorkings (any colour), cock or cockerel: W. J. Smythe, 1. Hen or pullet: W. J. Smythe, 1 and 2. Orphingtons, black cock or cockerel: W. Acland, 1; F. Rewell, 2. Black hen or pullet: W. J. Smythe, 1; J. Ackland, 2. Any colour cock or cockerel: W. J. Smythe, 1; C. R. Howard, 2. Hen or pullet: G. L. Throssell, 1; W. J. Smythe, 2. Wyandottes, golden cock or cockerel: R. G. Breman, 1; Jas. Fagan, 2. Golden hen or pullet: W. J. Smythe, 1. Silver cock or cockerel: F. C. Jessup, 1. Silver hen or pullet: W. J. Smythe, 1; E. H. Sedwarze, 2. Spanish cock or cockerel: W. G. Leeder, 1. Hen or pullet: W. G. Leeder, 1; Minorcas, cock or cockerel: R. Sermon, 1; R. W. Dennis, 2. Hen or pullet: R. W. Dennis, 2. Leghorns, white cock or cockerel: F. Rewell, 1; P. T. Dailly, 2. White hen or pullet: G. L. Throssell, 1 and 2. Brown cock or cockerel: E. G. Meares, 1. Brown hen or pullet: E. G. Meares, 1 and 2. Any other variety, cock or cockerel: W. J. Smythe, 1; R. W. Dennis, 2. Pullet: Hugo Throssell, 1; W. G. Leeder, 2. Heaviest cock in the show: J. Frease (9½lb.), 1; W. G. Leeder (8¾lb.), 2. Hen for breeding, any variety: W. J. Smythe, 1; D. Donald, 2. Pair crossbreds: W. G. Leeder, 1. Aylesbury ducks: W. G. Leeder, 2. Pekin drake: E. G. Meares, 1. Pekin duck: S. G. Meares, 1. Indian runner drake: F. Rewell, 1; E. G. Meares, 2. Duck: E. G. Meares, 1; T. P. Dailly, 2. Any other variety duck: W. G. Leeder, 1; F. Rewell, 2. Any other variety drake: Miss V. Smith, 1; W. G. Leeder, 2. Gander: Jno. Martin, 1; Hugo Throssell, 2. Goose: Jno. Martin, 1. Turkeys, cock: G. L. Throssell, 1; W. G. Stewart, 2. Hen: G. L. Throssell, 1.

PIGEONS.

Pouters: F. Rewell, 1; W. J. Smythe, 2. White fantails: F. Rewell, 1; Hugo Throssell, 2. Any other fantail: F. Rewell, 1 and 2. Carriers; T. Hird, 1. Dragons: F. Rewell, 1; Hugo Throssell, 2. Jacobins: M. Mears, 1; H. Woodhams, 2. English owls; F. Rewell, 1. Saddlebacks: F. Rewell, 1. Tumblers: F. Rawell, 1; Homers; W. J. Smythe, 1; J. P. Ackland, 2.

DAIRY PRODUCE.

Fresh butter: Mrs. L. Clifton, 1; Mrs. J. Martin, 2. Potted butter: G. T. Wilkerson, 1; Throssell and Stewart, 2. Two sides or middle of bacon: O. H. Wilding, 1; Jas. McManus, 1; T. H. Wilding, 3. Dozen hens' eggs: F. Rewell, 1; G. L. Throssell, 2. Dozen duck eggs: F. Rewell, 1. Collection dairy produce: F. Yates, 1; Jas. Macmanus, 2. Home-made bread: Miss L. Sheen, 1; Mrs. Schwarze, 2. Bread made from local flour: Jno. Anderson, 1. Confectionery (local made): Miss Stewart, 1. Bacon: J. Macmanus, 1; T. H. Wilding, 2.

FARM AND GARDEN PRODUCE.

Farm and garden produce and collection of vegetables: G. F. Wilkerson, 1 E. J. Oliver, 2. Potatoes: W. G. Leeder, 1; J. Mitchell, 2. Three head cabbage: R. J. Brennan, 1; H. F. Throssell, 2. Three head cauliflower: H. F. Throssell, 1; G. L. Throssell, 2. Turnips: H. F. Throssell, 1; G. L. Throssell, 2. Carrots: G. L. Throssell, 1; H. F. Throssell, 2. Parsnips: H. F. Throssell, 1; G. L. Throssell, 2. Wheat: J. M. Carroll (65lb. to bushel), 1; E. G. Leeder (64¾lb.), 2. Brown oats: J. M. Carroll, 1. Cape barley: J. M. Carroll, 1. English barley: J. M. Carroll, 1. Bag oaten chaff: C. J. Lloyd, 1; J. M. Carroll, 2. Bag wheaten chaff: J. M. Carroll, 1; Jas. Macmanus, 2. Sheaf of wheat: Mr. Cohen, 1; H. W. Hancock, 2. Sheaf of oats: H. F. Throssell, 1; Jas. Macmanus, 2.

FRUIT AND FLOWERS.

Dozen oranges: G. T. Wilkerson, 1. Lemons: L. Smith, 1. Home-made pickles: W. H. Hancock, 1. Hand-made preserves: W. H. Hancock, 1; T. H. Wilding, 2. Home-made tomato sauce: Mrs. Solomon, 1. Home-made jams: T. H. Wilding, 1; G. T. Wilkerson, 2. Button-hole bouquets: Miss Stewart, 1; Miss Morrell, 2. Table bouquets: W. J. Morgan, 1. Hand bouquets: H. F. Throssell, 1. Cut garden flowers: W. J. Morgan, 1. Wild flowers: Miss L. Eaton, 1; Miss L. Sheen, 2. Six varieties roses: W. G. Leeder, 1; Dr. Rocket, 2. Collection pot plants: C. A. Prince, 1; G. H. Smith, 2. Wild flowers (children under 14 years): Miss R. Eaton, 1. Design table decoration, in flowers: Miss R. Morrell, 1; Mrs. C. A. Prince, 2. Wild everlastings: Miss Chidlow, 1; Miss Morgan, 2. Collection bulbs: E. J. Oliver, 1; Miss Chidlow, 2.

INDUSTRIAL.

W.A. flour: Jas. Gillespie, 1 and 2. Machine-made bricks: H. Edmeades and Co., 1. Fertilisers: H. Edmeades and Co., 1. Aerated water: R. G. Mears, 1.

IMPLEMENTS AND MACHINERY.

Table-top waggon: S. Cook, 1. Tip-dray: E. Cook, 1. Double-seated buggy: Victoria Carriage Works, 1. Single-seated buggy: Victoria Carriage Works, 1. Sulky: Victoria Carriage Works, 1. Double-furrow stump-jump plough: G. L. Throssell and Co., 1. Three-furrow stump-jump plough: A. Powell, 1. Four-furrow stump-jump plough: A. Powell, 1. Five-furrow stump-jump plough: G. L. Throssell and Co., 1. Stump-jump harrows, three levers: G. L. Throssell and Co., 1. Ordinary weather stripper: G. F. Throssell and Co., 1. Field roller: G. F. Throssell and Co., 1. Collection implements and machinery: G. L. Throssell and Co., 1.

PIGS.

Berkshire boars (over 12 months): T. Hird, 1; H. F. Throssell, 2. Berkshire sow: Maud Dempster, 1; H. F. Throssell, 2. Yorkshire boar: W. P. Dempster, 2. Yorkshire sow: F. Rewell, 1. Boar, any other breed: F. Cooke, 1. Sow, any other breed: H. F. Throssell, 1. Boar (12 months or under): H. F. Throssell, 1; Maud Dempster, 2. Sow (12 months or under): H. W. Hancock, 1; Maud Dempster, 2. Sow, with litter: F. Rewell, 1; Maud Dempster, 2.

SHEEP.

Merino rams: Maud Dempster, 1; T. H. Wilding, 2. Merino ewe: Maud Dempster, 1. Crossbred: Maud Dempster, 1; H. F. Throssell, 2. Longwool: Maud Dempster, 1.

CATTLE.

Best milking cow: Mrs. J. R. Morrell's "Bluey" (25lb. of milk), 1; W. R. Morrell's "Fanny" (24lb.), 2. Champion bull of the show: Mr. A. W. Edgar's "Lindlow," 1.

WINES.

Dry red (1902 or older): W. and H. Logue, 1. Sweet, red (1902): H. G. Monger, 1. Dry, white (1902 or older): W. and H. Logue, 1. Sweet, white (1902 or older): W. and H. Logue, 1. Dry, red (1903): H. S. Monger, 1. Sweet, red (1903): H. S. Monger, 1. Dry, white (1903): W. and H. Logue, 1. Sweet, white (1903): W. and H. Logue.

HORSES.

Trotter, in harness: H. Hummerston's "Midnight," 1; G. L. Throssell's "Poet," 2. Trotter, in saddle: H. Hummerston's "Midnight," 1; G. L. Throssell's "Poet," 2. Pair of buggy horses (15·2 a.u.): H. Hummerston, 1. Harness pony (13·2 a.u.): H. Ewert's "Commodore Nut," 1; J. Mitchell, 2. Pair of buggy horses (15·2 a.u.): H. Hummerston, 1. Harness pony (13·2 a.u.): H. Ewert's "Commodore Nut," 1; J. Mitchell, 2. Single buggy horse (15·2 a.u.): H. Hummerston's "Pretoria," 1; Butler H. Lacey's "Auctioneer," 2. Pair of carriage horses (15.2 a.o.): H. Hummerston, 1. Girl's pony (14·2 a.u.): F. Rewell, 1; J. Gillespie, 2. Hunter (up to 12st.): L. Clarkson's "Lang Syne," 1: J. K. Cowper's "Botany," 2. Lady's hack: L. Clarkson's "Eastland," 1; J. Mitchell's "White Wings," 2. Single buggy pony (between 13·2 and 14·2): F. Rewell, 1; R. G. Meare's "Ruby," 2. Weight-carrying hack: J. Mitchell's "Jack," 1; H. Hummerston's "Miss Paterson," 2. Pair of hacks: J. Mitchell, 1; L. Clarkson, 2. Hunters (including the condition of the horse, outfit, and rider): J. Mitchell's "Jack," 1; L. Clarkson's "Lang Syne," 2. Gent's hack (11st. or over): F. C. Thomas's "Strongbow," 1. Lady's jumper: Lionel Clarkson's "Lang Syne" (ridden by Miss E. Clarkson), 1. Gent's hack (10st.): L. Clarkson's "Eastland," 1; L. Clarkson's "Lang Syne," 2. Military fours (jumping contest): Northam team, 1; Newcastle team, 2.

At the Agricultural Society's banquet, which was held at the Commercial Hotel in the evening, and presided over by Dr. Dunlop, the Premier (Mr. Walter James), responding to the toast of "The Premier and the Ministry," said that what he had seen that day had convinced him of the undiminished energy of the people of Northam. Referring to the progress of agriculture in the State, he announced the intention of the Government to continue the policy of re-purchasing estates for closer settlement. He traversed the main features of the Budget to show the position of the State. He suggested that the figures were so great, in proportion to the population, that it was difficult to fittingly appreciate their importance. There was available for the new financial year a sum of nearly £4,000,000, and that, too, without any taxation bearing severely on either individuals or industries. Look wherever they would, prosperity was apparent on every hand. It would have been quite open to the Government to cut down the estimated expenditure, and so show a larger surplus, but that he held to be undesirable. The money was there, and in a young country it should be expended. If they had twice the amount they could spend it in good works in all parts of the State. Various industries needed support, and various communities needed help, and the Government proposed to attend to both. The subsidies to Roads Boards were to be increased by £70,000, in addition to special votes for specified roads and bridges. (Hear, hear.) The municipality vote was to be increased to £65,800, to be distributed under a special scheme proposed by the Government. By that scheme the smaller municipalities would receive a distinct advance on past benefits, and it would rest with them to increase their taxation. The recreation reserves vote would be increased to £14,000, hospital buildings to £48,475, and school buildings to £45,475. Towards the construction of railways £87,000 would be provided, with £28,000 for rabbit fencing, £25,000 for the extension of batteries, £15,000 for the purchase of ore and the development of the Phillips

River field, and £7,000 for mines development. By these they would see that money was being spent in a way that would commend itself to them. In other States these items were paid for out of loans, whereas the Government of Western Australia was endeavouring to make a considerable contribution from the revenue towards carrying out these works. The utterances of the Treasurer with regard to the inaccessibility of the London market for the Australian States had been made on the best financial advice procurable in this and the other States. Fortunately, Western Australia could afford to keep off that market, a fact that constituted magnificent testimony to the financial position of the State. Referring to the rapid increase in agricultural settlement, he declared the determination of the Government to bring the Lands Department up to date. With that sole end in view the Government was spending £50,000 per annum. (Loud applause.) The future, he said, was wrapped up in the two main industries—mining and agriculture—and, although other industries were of importance, it was the duty of the Government to expand these main industries. If the prosperity of the State was to continue, it could only be on a policy that would stimulate mining and agriculture. If it fell to him to communicate the policy for the next general election, that policy would be based on these two factors. They must have population on the mines and population on the soil. He had no doubt but that they would live to see a total population in Western Australia fully equal to that in the East.

The Minister for Public Works and Railways (Mr. Rason), responding to the same toast, said that he complimented the Local Roads Board on the good work that it had done in the past, for, in his opinion, there could be no wiser expenditure in a young State than that on the making of roads. He looked forward with confidence to the good work that would be effected under the special votes and estimates for the making of roads and the sinking of wells in the agricultural areas. He quoted the opinion of Professor Todd, that the greatest need of South Australian agriculture was a permanent and reliable water supply, and that in the course of time, that need would be supplied. What was true of South Australia was also true of Western Australia, and for that reason the Government was prepared to do a lot to secure a reliable supply; but in this it would have to be assisted by the settlers themselves. He thought that if the Government, by a trial bore, demonstrated the existence of water, that was as much as could be expected of it. The present prosperous time was the time for the settler, by the conservation of water, to provide against a contingency such as a dry or a bad season. The opening-out of the existing stock routes was of great interest to all agriculturists, and in this direction the Government was prepared to spend a lot of money. Rather than extend the existing agricultural railways Ministers were inclined to first give motor waggons a trial. They had decided to get one or more, and see what would meet the requirements of the district in which it would be placed. In this regard, he generally invited specific information as to the most suitable district for experiment, and particulars as to what traffic might be expected. The Government was determined to be in every way practical, and to avoid any dreams or any frittering away of money as a means of securing a fleeting popularity. Ministers had no fear of the results of the next general elections. They had been accused of many very wicked actions, chief among which was a refusal to lend countenance to the abolition of the Upper House or to increased representation for Perth, or to the sacrifice of the agricultural districts. (Cheers.) He believed that the people of the State would recognise honest endeavour and honest work, faithfully done in the best interests of the State. (Applause.)

KELMSCOTT AND ARMADALE.

The eighth annual show of the Kelmscott and Armadale Agricultural Society was held on Thursday, the 7th inst., at Kelmscott. The show was a good one, and attracted a very large number of visitors. The following is the prize list:—

VEGETABLES.

Collection of vegetables: Albert Butcher 1. Broad beans: Mrs. W. E. Saw, 1; H. J. Butcher, 2. Beetroot (long): Albert Butcher, 1; Thos. James, 2. Beetroot (turnip): Albert Butcher, 1; Thos. James, 2. Cauliflower: H. J. Butcher, 1 and 2. Cabbage: Jas. Butcher, 1; H. J. Butcher, 2. Red Cabbage: Albert Butcher, 1. Lettuce (cabbage): W. E. Saw, 1. Onions: Jas. Butcher, 1; Albert Butcher, 2. Potatoes (one variety): Jas. Butcher, 1; A. V. Cross, 2. Do. (two varieties): Jas. Butcher, 1; R. T. Marsh, 2. Do. (four varieties): Mrs. W. E. Saw, 1; Jas. Butcher, 2. Peas: Mrs. W. E. Saw, 1; H. J. Butcher, 2. Parsnips: Jas. Butcher, 1 and 2. Shallots: Albert Butcher, 1; H. J. Butcher, 2. Turnips (swedes): Jas. Butcher, 1; Alf. Butcher, 2. Mangolds: Jas. Butcher, 1; Albert Butcher, 2. Collection of root crops: Albert Butcher, 1. Collection of salads: Alb. Butcher, 1; B. V. Cross, 1.

FRUIT.

Apples, eating: Jas. Butcher, 1. Do., cooking: J. Steffan, 2. Do., Rome Beauty: Albert Butcher, 1. Bananas: Mrs. A. Martin, 1; E. Cockram, 2; Cape Gooseberries: S. Salter, 1; Alf. Butcher, 2. Lemons: Mrs. W. E. Saw, 1; A. E. Kimber, 2. Loquats: Cockram and King, 1; W. Brookman, 2. Mandarins: A. E. Kimber, 1; E. F. Marsh, 2. Oranges, navel: A. E. Kimber, 1 and 2; do., other: A. E. Kimber, 1 and 2. Passion Fruit: Mrs. W. E. Saw, 1. Pomelos: A. V. Cross, 1. Strawberries: W. E. Saw, 1; A. E. Kimber, 2.

FLOWERS.

Roses, 12 varieties: Mrs. J. Sinclair, 1; Miss M. Sinclair, 2. Do., 6 varieties: Mrs. J. Butcher, 1; W. Buckingham, 2. Do., 3 varieties: Mrs. W. Butcher, 1; Mrs. J. Butcher, 2. Champion rose: Mrs. J. Butcher, 1; Mrs. J. Sinclair, 2. Bunch of garden flowers: Mrs. J. Sinclair, 1; Miss A. Cockram, 2. Bunch of wild flowers: Miss A. Cockram, 1; Mrs. A. Salter, 2. Gentlemens' buttonholes (garden): Miss A. Cockram, 1; Mrs. A. Salter, 2. Do., do. (wild): Miss A. Cockram, 1; Mrs. A. Buckingham, 2. Hand Boquet (garden): Mrs. W. E. Saw, 1; Miss A. Cockram, 2. Do. do. (wild): Miss A. Cockram, 1; Miss A. Martin, 2. Bunch everlastings: Miss A. Cockram, 1; Miss Linda Bolt, 2. Do., carnations: Mrs. W. E. Saw, 1. Do., violets: Miss A. Cockram, 1; W. Buckingham, 2. Wreath of wild flowers: Miss A. Cockram, 1; Miss M. Buckingham, 2. Do. do., garden flowers: Mrs. W. E. Saw, 1; Miss E. Martin, 2. Lady's spray (wild): Miss M.

Buckingham, 1; J. L. Lockyer, 2. Do. do. (garden): Mrs. W. E. Saw, 1. Floral design: Miss A. Cockram, 1; J. L. Lockyer, 2. Collection kangaroo paws: Miss J. Butcher, 1; E. Cockram, 2. Do., orchids: Miss J. Butcher, 1; Miss A. Cockram, 2. Do., pansies: Robt. Batt, 1. Do., everlastings: Miss A. Butcher, 1; Miss F. Murray, 2.

POULTRY.

Game: Thos. Hartle, 1. Andalusian (cock): T. Martin, 1; B. V. Cross, 2. Leghorn (white cock): A. V. Cross, 1. Do. (brown cock): T. Hartle, 1; W. Gibbs, 2. Orpington buff (cock): A. Butcher, 1 and 2. Wyandottes. silver (cock): A. Butcher, 1 and 2. Do., gold (cock): W. Gibbs, 2. Plymouth Rock (cock): Mrs. J. S. White, 1. Houdan (cock): Thos. Martin, 1 and 2. Andalusian (hen): Thos. Martin, 1; B. V. Cross, 2. Leghorn (white hen): B. V. Cross, 1; T. Hartle, 2. Do. (brown hen): W. Gibbs, 1 and 2. Minorca (hen): B. V. Cross, 1. Orpington buff (hen): A. Butcher, 1 and 2. Wyandottes, silver (hen): A. Butcher, 1; W. Gibbs, 2. Plymouth Rock (hen): Mrs. J. S. White, 1 and 2. Houdan (hen): T. Martin, 1. Ducks (Indian Runner): R. Batt, 1; A. V. Cross, 2. Do. (Pekin): Mrs. A. Salter, 1; H. Hilbert, 2. Geese: Mrs. T. S. Dunckley, 1 and 2. Turkeys: W. Gibbs, 1. Duck eggs: A. V. Cross, 1; H. Hilbert, 2. Hen eggs: Mrs. W. E. Saw, 1; J. Butcher, 2.

SUNDRIES.

Butter: A. V. Cross, 1; Mrs. W. E. Salter, 2. Bread (home made): Mrs. W. E. Saw, 1; Miss A. Cockram, 2. Scones: Miss E. Martin, 1; Miss M. Buckingham, 2. Fruit cakes: Miss E. Buckingham, 1. Honey (bottle): Mrs. Wm. Lance, 1. Collection of jams: Mrs. W. E. Saw, 1 and 2. Marmalade: Mrs. W. E. Saw, 1; Mrs. W. Butcher, 2. Apricot: J. L. Lockyer, 1; Mrs. W. E. Saw, 2. Peach: J. L. Lockyer, 1; Mrs. W. E. Saw, 2. Plum: Mrs. W. E. Saw, 1; Mrs. S. Salter, 2. Fig: Mrs. S. Salter, 1; Mrs. W. Butcher, 2. Grape: Mrs. S. Salter, 1; Mrs. W. E. Saw, 2. Cape gooseberry: Mrs. S. Salter, 1; A. Butcher, 2. Strawberry: Mrs. W. E. Saw, 1. Mulberry: Mrs. W. E. Saw, 1. Home-made jelly; Mrs. S. Salter, 1. Pickles: Mrs. M. E. Ward, 1; Mrs. W. E. Saw, 2. Tomato sauce: B. V. Cross, 1; Mrs. W. Butcher, 2. Ham: B. V. Cross, 1. Dried apples: J. L. Lockyer, 1. Do., raisins: Mrs. W. E. Saw, 1; Mrs. M. E. Ward, 2. Fancy work: J. L. Lockyer, 1. Best got-up shirt: W. M. Gordon, 1. Dolls, best dressed; Miss V. Wall, 1. Design in wild flowers (for boys): H. Brookman, 1; H. Cockram, 2.

CATTLE.

Jersey cow: R. G. Marsh, 1; Cockram and King, 2. Jersey bull: A. Butcher, 1. Ayrshire bull: A. Butcher, 1. Jersey heifer: G. F. Marsh, 1; J. Butcher, 2. Heifer (crossbred): Robt. Batt, 1; S. Salter, 2. Crossbred dairy cow: L. Butcher, 1; R. G. Marsh, 2. Milch cow: Alf. Butcher and Robt. Batt, equal.

PIGS.

Berkshire boar: J. Morley, 1; A. Butcher, 2. Yorkshire boar: G. W. Stubbs, 1. Do., sow: G. W. Stubbs, 1; A. Butcher, 2. Sucking pig: A. Butcher, 1.

HORSES.

Blood Stallion: Cockram and Kings's Ormuz, 1; E. Bateman's Richburg, 2. Lady's Hack: Wm. Jordan, 1; Miss S. Connell, 2. Gent's hack: James Biller, 1; Cockram and King, 2. Hunter: J. Butcher, 1; G. W. Coffin, 2. Pair draught horses: Cockram and King, 1. Sulky turnout, open: Wm. Gordon, 1; Bickford and Smith, 2. Do., do., members only: Mrs. W. G. Brookman, 1; W. G. Gordon, 2. Farmer's spring turnout: W. Butcher, 1.

POULTRY NOTES.

By Frank H. Robertson.

Leghorns.

As egg producers, Leghorns are one of the best if not actually the best breed for this purpose, they of course are not good table poultry, and as a rule are non-sitters. On this account some persons object to the breed, but it is impossible to combine in any one breed of fowls—the best egg production, best table qualities, and best sitters. As useful qualities, egg results must have first consideration, therefore Leghorns are one of the most profitable breeds of poultry anyone can keep; and to overcome the difficulty of the brooder question, there are two ways of doing so, viz., either by means of artificial incubation or by keeping a supply of fowls which lay brown eggs, these can run with the pure Leghorn hens, and as the latter lay white eggs the pure bred's eggs are easily distinguishable from the crossbred's, this provided only pure Leghorn roosters run with the hens. Pure bred and cross can thus be bred from the one flock, the hens laying the brown eggs will almost invariably go broody, in this manner Leghorn breeders can easily supply their own broody hens for raising chickens. In fact all poultry keepers should breed their own brooders, as the introduction of clucking hens from other yards is a frequent cause of spreading the tick pest, the best plan for every breeder of fowls of Mediterranean blood is to also keep a small pen of one of the good brown egg laying kinds such as Wyandottes, Orpingtons, Langshans, or Plymouth Rocks, or if this plan is likely to take up too much room or trouble, make a point of buying eggs every year of any of the above-mentioned breeds. By working on these lines, the poultry keeper sticks to his good pure bred egg producers, and at the same time obtains interesting experience in the qualities of other breeds, and also serves the useful purpose of supplying his own brooders. There are several varieties of Leghorns, but the best known are the brown and the white. As to which is the better layer of the two it is hard to say, it is certainly rare to find bad or indifferent layers in either kind, but it is quite certain that some strains of either variety are better than others, it is wise, therefore, for the beginner in selecting stock birds or eggs, to endeavour to get reliable information as to the laying qualities of his purchases, and the existing breeder would find it to his advantage to note the good layers of his flock, and use their eggs in preference to the others for raising the chickens. Of course, it is very nice to combine a good egg supply with fine feathers and graceful form, but it is impossible to combine in the highest degree first-class show poultry and first-class egg production; the reason being that the person breeding for show points is too prone to select the eggs from the finest looking birds, irrespective of their utility qualities. Still, many a purely utility breeder will breed specimens well worthy of gracing the show pen, and, unfortunately, he frequently, through want of knowledge of the fancy points, sells a show fowl to a better-informed person, who successfully exhibits and thus gains honour and cash which might just as easily been the lot of the original owner. Every breeder of pure stock should be able to spot a good show bird when he breeds one. The accompanying illustration and detailed description and schedule of points, as laid down by the Poultry Standards of England, will be found necessary for that purpose.

General Characteristics of Cock.

Head and Neck.—Beak: stout, the point standing well clear of the front of the comb. Comb: Fine in texture, large, but not overgrown, single, perfectly straight and erect, deeply and evenly serated, the spikes broadening at the base; extending well beyond the back of the head and following, without touching, the line of the hackle; free from thumb-marks and side sprigs. Face: Fine in texture, and free from wrinkles or folds. Wattles: Long, thin, and fine in texture. Lobes: Well developed and rather pendant, equally matched in size and shape, smooth, open, and free from folds. Neck: Well arched and full in hackle.

Body.—Wedge-shaped, wide at the shoulders, and narrowing to the root of the tail. Breast: Round and prominent, the breast bone straight. Back: Slightly rounded and sloping to the tail. Wings: Large, carried well clipped up.

Tail.—Moderately full, carried at an angle of 40° to 45°.

Legs and Feet.—Legs long, the shanks free from feathers, feet well spread, the toes long and straight.

Carriage.—Upright.

Size.—Medium, rather large to be preferred, consistently with symmetry and type.

General Characteristics of Hen.

Beak, Wattles, Face, Lobes, and Neck.—As in the cock. Comb: Fine in texture, large but not overgrown, single, deeply and evenly serated, free from side sprigs, rising from a firm base and falling gracefully over to either side of face.

Body.—Wide at the shoulders and narrowing slightly to the tail, longer and not carried so upright as in the cock. Breast: Round, full and nicely curved from the neck. Back: Long, fairly broad, and but slightly rounded.

Tail.—Fairly long and moderately full, but carried closely and at a slightly lower angle than the cock.

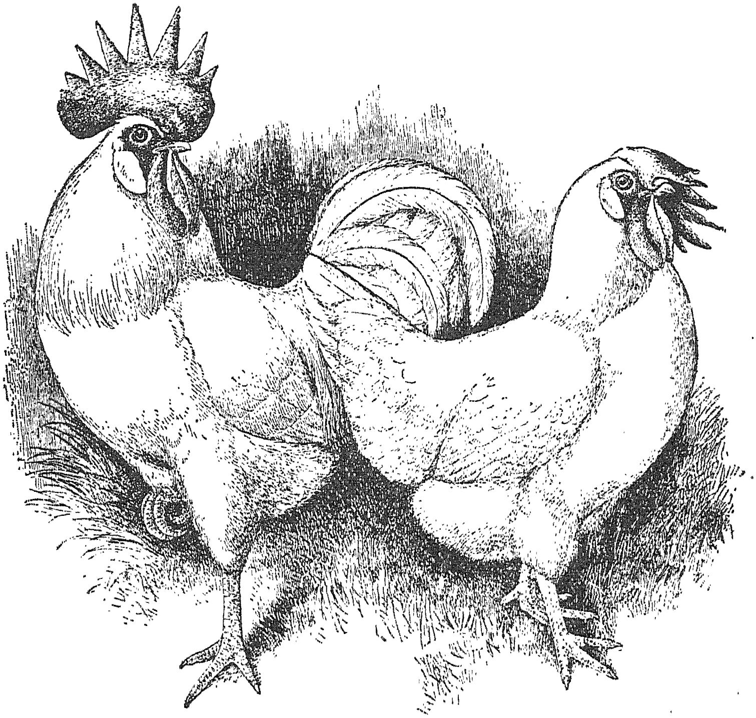
Legs and Feet.—As in the cock.

Carriage.—Description of cock applies.

Size.—As in the cock.

Colour in White Leghorns.

In both sexes.—Beak, yellow; eye, red; comb and wattles, bright red; face, bright red, without any trace of white; lobes, white or cream, the former preferred; toe-nails, yellow; legs, yellow or orange; plumage, pure white (straw colour is to be avoided).



White Leghorn.

Colour in Brown Leghorns.

In Both Sexes.—Beak: Yellow or horn. Eye: Red. Comb and Wattles: Bright red. Face: Bright red, without any trace of white. Lobes: White or cream, the former preferred. Toe-nails: Horn or nearly white. Legs: Yellow or orange.

In the Cock.—Head and Hackle: Rich orange red, striped with black; crimson red at the front of the hackle below the wattles. Back, Shoulder Coverts and Wing Bow: Deep crimson red or maroon. Wing Coverts: Steel blue, with green reflections, forming a broad bar across the wing, primary wing feathers brown. Secondaries: Deep bay on outer web, which is all that appears when the wing is closed, and block on the inner web, and covering the points. Saddle: A rich orange red, with or without a few black stripes. Breast and Under-parts: A glossy black, quite free from brown splashes. Tail: Black, with green reflections, any white in tail is very objectionable. Tail Coverts: Black, edged with brown.

In the Hen.—Hackle: Rich golden yellow, broadly and sharply striped with black. Breast: Salmon red, running into maroon around the head and wattles, and ashy grey at the thighs. Body Colour: A rich brown, very closely and evenly pencilled with black; feathers free from light shafts. Tail: Black, outer feathers pencilled with brown.

Value of Points in Leghorns.
(Cock or Hen.)

	Deduct up to
Defects in comb	12
Defects in ear-lobe folded, wrinkled, or stained with red ...	15
Defects in colour...	25
Defects in legs	8
Want of condition	10
Want of size	15
Want of symmetry	15
A perfect bird to count	100

Serious defects for which a bird should be passed. Cock's comb twisted or falling over, or hen's erect; ear-lobe red; any white in face; legs any colour but yellow or orange; wiry or squirrel tail, or any bodily deformity.

A FERTILISER FROM THE ATMOSPHERE.

Are we within measurable distance of obtaining a supply of chemical manure from the atmosphere? is a question that has occurred to many chemists and agriculturists, now that the exhaustion of the nitrate beds of Chili is a matter of a few years. It is estimated that the column of air above an acre of land contains something like 32,000 tons of nitrate, so that there is practically an inexhaustible supply which may be drawn upon. It has long been demonstrated in the laboratory that nitrate can be obtained from the air, but the result has been obtained at a cost that places it beyond the reach of the agriculturist. Of late much attention has been directed to the utilisation of this vast store of nitrogen in such a manner as to make it an industrial product. For two years past Dr. M. Gerlach and Professor P. Wagner have been engaged in a series of experiments, with the view of solving this interesting problem. The result of their labours has been deemed so satisfactory that an influential syndicate has been formed in Berlin to establish a large manufactory for the production of nitrate from the atmosphere. The process employed in this enterprise is to compress air that has previously been deprived of its oxygen, in carburetted calcium, maintained in a state of fusion in the intense heat of an electric furnace. By this process a substance is obtained which is described by chemists as cyanamide of calcium. It forms white crystals, which are soluble in water, and which contain, when pure, 35 per cent. of azote. The impure cyanamide of calcium, which is industrially obtained, contains a certain proportion of lime and carbon, and, when ground, appears as a dark powder, containing from 15 to 25 per cent. of azote. The preparation of sulphate of ammonia from azote that has been obtained from the atmosphere now presents no difficulty. Whether the new product will prove as good a fertiliser as the nitrate manure from the deposits in Chili is not clearly stated, but the inference to be drawn from what has been said of the new product is it is quite as good a fertiliser. No statement has yet been made as to the cost to the agriculturist of the new product, which is a most important matter, but, from the fact that the enterprise has received the support of some of the most influential firms in Berlin, it may be fairly anticipated that the cost will not be excessive. The advantage of a practicable process for obtaining nitrate manure from the atmosphere is that the operation may be conducted in any locality that may be regarded as convenient.—*The Australasian.*

BEE NOTES.

By J. SUTTON.

The past month has been far from a good one, if viewed by an apiarist, swarming being checked to a great extent by the continual showers.

In those districts where the weather is still threatening every care should be taken to guard against short supplies for the bees. Be on the safe side, and when there appears to be little or no stores being brought in, feeding should be resorted to at once.

The apiaries in and around Perth and its suburbs, however, are much better; in many cases swarming has commenced and a small flow started.

During a visit just made to the Geraldton district I was struck with the great possibilities which appear to exist for the success of bee-keeping. Still it must be remembered that just now the country is looking its best, and it would be necessary to pay another visit when summer has well advanced before recommending any one venturing to start in anything like a large way.

The outlook for the coming honey season is certainly very encouraging, although rather late. No pains should be spared in making the colonies as strong as possible; weak colonies should be liberally fed, and, when possible, united.

OPENING THE BEE-HIVE.

PRACTICAL SUGGESTIONS FOR THE BEGINNER.

George Shiber in American Bee-Keeper:—The season of prodding for the bee-keeper is again at hand. There is a great difference in the amount of this prodding that different bee handlers bring upon themselves, or at least in the amount of fuss they make about it. The manner of opening a hive has a great deal to do with the amount of disturbance that is created.

A good many beginners don't learn how to open a hive properly. Many text-books don't give the best of instructions on this point. I was bothered for some little while before I got on to the best way. Occasionally one sees directions given by a bee editor. Such directions are all right for gentle Italians, but for blacks do not usually work. When James Heddon published his book, "Success in Bee Culture," I found in that a method for opening a hive of bees that will work.

Take the average colony of blacks or hybrids, have your smoker in good trim, blow smoke across the entrance, and, if no honey flow is on, into the entrance, then noiselessly pry up the cover and pour two or three good puffs of smoke into the top of the hive, when you can handle your frames rapidly. But half smoking such a colony will make perfect terrors. With the gentler bees less smoke is needed, but the method should be the same. This can be done quickly. Smoking the entrance starts the panic, and the smoke on top of the frames completes it, and also gains the complete surrender of the crossest hybrids.

I have had experience only with the blacks, Italians, Carniolans and their crosses. Always perform the act of smoking the entrance, under cover, and opening the hive quickly—very fast. Don't wait for the bees to fill with honey; let them fill afterward, while you are manipulating, or not at all. Operating in this way you will not have a lot of cross bees to bother your neighbours.

At times, when at work opening a number of hives, one will accumulate a guard of honour in the shape of a dozen or so of cross bees, whose ire has been aroused by some accident. Now, don't leave the apiary and leave this guard to keep this thing up as long as they live, for they will, but pick up a fence separator and "knock the stuffing out of them"; then you will have a yard of peaceful bees. A "fence" makes a dandy weapon to kill bees. Try it.—*Exchange.*

[A better plan by which to kill a cross bee is to make a wire frame with a piece of fine gauze stretched tightly over it, this will enable you to strike the bee by allowing the wind to go through the bat. If a piece of wood is used the pressure of the air is apt to push the bee out of harms way.—Ed. *Journal.*]

UNCUT SILAGE.

Referring to an inquiry and its answer in regard to this matter, W. J. Langdon, Summer, Wash., writing to *Hord's Dairyman*, says:—In my opinion, your advice is faulty and will have a tendency to discourage a great many poor farmers from building a silo. After some description of the conditions in his region he says:—

"I was not able to build a silo, to say nothing of machinery, but I had to have a silo, and spent £7 for material, and with the help of a neighbour one and a half days I built a silo 8 : 4 x 10 : 4 and 28 feet deep, that is a success so far as I can see. I put into the silo first peas and oats that were nearly ripe (peas seldom ripen entirely on our bottom land), then I put in a second crop (clover), which I covered and let stand until the corn was ready. I then put Cory's early sweet corn (a few of the ears were ready for the table), and then put in green oats that were sowed after first crop of timothy was taken off, then the balance of the corn, then green peas and oats (the peas and pods half formed), then a second crop of timothy, covering with a loose layer of matched boards.

"None of this material was cut or bound, but was hoisted to a platform near the top of the silo with horse fork and slings. I distributed all except the corn from the top, and my boy, 12 years old, tramped it thoroughly around the edges. The corn was laid on the platform straight. My man dropped it down to me an armful at a time and I laid it down in layers with butts to the wall with first row. The butts of second row came just above the ears of first row and so on across the silo; then turned butts against opposite side for next course and so on up; being careful to tramp stalks along the sides on the butts. The silage soured a little around the sides and occasionally a spot of white mold, but otherwise it seems perfect, and cattle and hogs eat it greedily. Now, as to getting the silage, I haven't had any trouble whatever in getting it out, it simply peels up in sheets. The corn, if handled carefully, will come up without trouble, easier and quicker it seems to me than if the silage was cut, although I have never seen any cut silage."

We are unable to see in what very important particular Mr. Langdon's practice differs from the advice we gave, especially to have had less trouble in getting the silage out than we had anticipated, and we are very much obliged to him, as we will be to any others who can point out any improvements in any methods, whether proposed by us or correspondents.

PERIOD OF GESTATION IN EWES.

SOME INTERESTING AMERICAN EXPERIMENTS.

This interesting matter in connection with sheep-breeding has formed the subject for a long series of experiments at the Wisconsin Experiment Station, U.S.A., where the college flock numbers 524 head of several pure breeds and their crosses. The conclusions given are based upon a long series of years—some 12 to 14—and are consequently of considerable value, for the period of time during which observations have been taken is of sufficient length to give plenty of opportunities for any abnormal event of any year to be counterbalanced by those of another; and thus the results may be fairly considered to be what, under ordinary circumstances, will prevail. At this station all rams are kept separate from the ewes, which are brought to them for service, so that a correct record for each individual ewe was readily kept. A table is given in the report, from which it is seen that the 524 ewes dropped their lambs during a period which ranged from 140 to 156 days after coupling. The largest number of ewes—113, or 21·6 per cent.—dropped their lambs on the 146th day. The next largest fall occurred on the 147th day, when 81, or 15·5 per cent., lambed. Seventy-three ewes, or 13·9 per cent., lambed on the 145th day; 50 ewes, or 9·5 per cent., on the 142nd, 143rd, and 144th day; 76, or 14·5 per cent., lambed on the 148th day; 61, or 11·7 per cent., lambed on the 149th day; 31, or 5·9 per cent., lambed on the 150th day; and 36 ewes, or 6·8 per cent., lambed between the 151st and 154th day, leaving three to be accounted for. One of these lambed on the 140th day, and one on the 155th day, and the other on the 156th day, the lambs in each of these cases being dead. From these results it may, therefore, be safely assumed that 83·1 per cent. of the ewes may be expected, on the average of years, to drop their lambs during the period covered by the 145th to the 150th day from the date of coupling. If, therefore, the flockmaster took means to ascertain the actual date of the coupling, what a very large amount of trouble and bother could be prevented. In many flocks the period of lambing runs well over the month, and all through that period, or nearly so, the ewes are marched to the lambing fold at night, and back again next day. With this reliable information at command—for the conclusions are based upon actual experience—it is now quite possible for the birth of the lambs to be gauged within a reasonable certainty, and provision made accordingly. Another interesting point brought to light in this experiment is that, taking a series of years, the proportion of males and females is practically identical. During the 12 years in which accurate records have been kept the percentage of males was 49·94, and females 50·06.

Dividing the lambs born into three groups—small weighing less than 8 lbs. at birth, medium weighing from 8 lbs. to 10 lbs. inclusive, and large weighing above 10 lbs.—it was found that 60 per cent. of the small lambs were carried 146 days or less, and the balance over that period. Of the medium lambs, 34 per cent. were carried 146 days or less, and 57 per cent. were dropped after the 146th day. Of the large lambs, only 31·6 were born within 146 days, 68·4 per cent. being carried in excess of this period. This information would, then, appear to indicate that the earlier born lambs are smaller, and the heavier lambs are carried a longer period.

CHARCOAL FOR FOWLS.

No better Corrective of Bad Digestion Exists.

There is no food or corrective, in the way of digestive, that equals charcoal. It is easily had, because various forms of the article may be made by the poultry raiser himself. Ear corn, corn-cobs, and wood of almost every kind may be used in the manufacture of the charcoal. The charred wood, cobs, etc., should be mixed with a soft feed when indigestion appears in the flock, or when there is suspicion that such trouble exists. The best method in poultry raising in the matter of feeding for health is to have charcoal at all times where the fowls have access to it. It is also a good plan to feed some burnt grain quite frequently, burnt corn, oats, wheat, rye, barley—any of these grains make a good corrective of diarrhœa or bowel complaint in fowls.

Here is an important thing in poultry raising. The strictly healthy fowl does not have bowel complaint; looseness of the bowels in fowls is simply an indication of indigestion or derangement of the digestive organs. Guard against this; whenever you detect symptoms about the roosts that lead you to believe this condition exists, correct it at once by feeding digestives, and nothing is better than charcoal.

In experiments made to determine the benefits of charcoal in feeding, if any, four turkeys were confined in a pen and fed on meal, boiled potatoes, and oats, and four others of the same brood were at the same time confined in another pen and fed daily on the same articles, but with one pint of finely pulverised charcoal mixed with their food. These had also a plentiful supply of broken charcoal in their pen.

The eight were killed and there was a difference of one and one-half pounds in favour of those supplied with charcoal. They were the fattest and the meat was superior in point of tenderness and flavour.

THE TRAP NEST.

Contrivance for Locating the Profitable Hen.

Up-to-date farmers are testing the milk of their cows in order to discover which cow has the richest milk, pays for her keep, and makes the best returns to her owner; in fact, a farmer who does not test the milk of his cows is behind the age, and in the strife of life cannot be a winner. So it is with fowls. Up-to-date poultry keepers must test their hens to discover the good layers, for in a flock of hens some are not laying at all—are simply eating their heads off; some may be laying occasionally, but scarcely enough to pay for their feed, while a few may be laying prolifically. Some hens may be producing over 200 eggs per year; others not over two dozen. How to find out the profitable hen is the problem which has been solved by the trap nest. A "trap nest" is simply a nest or box, the entrance to which closes automatically when the hen steps on the nest, keeping her a prisoner until released. You thus discover which hen lays the egg, and by breeding only from good layers and discarding the poor ones a flock of fine layers will soon be built up.

There are a number of trap nests on the market. The best is the one that is most comfortable for the hens and convenient for the attendant. This I have found to be a double-compartment nest, composed of a nest or box with a passageway. The hen walks through the passage, not noticing the open door, and when she steps on the nest, at the end of the passage, the entrance door to the passageway closes behind her, automatically and quietly, so that it does not frighten her. When the hen has laid she gets off the nest into the passageway, expecting to walk out as easily as she came in, but finds the door closed. The passageway is light, being made of laths about two inches apart. The box where the egg is laid is darker, so the hen does not break or eat an egg, which she would be apt to do if confined in the same box where the egg is laid. Some of the trap nests are simply a box with a door that drops down, and keeps the hen in the box. These traps are apt to frighten the hen; also, unless released the moment the egg is laid, she may, in her efforts to get out, break the egg and learn to be an egg-eater.

A trap nest that frightens a hen is very bad, for if a hen is frightened or prevented from going on her usual nest she will hold her egg a day or more, so that day's egg is lost; and if this is continued, she will eventually be a poor layer. Some trap nests close so noisily that the hens will lay on the ground outside the nests rather than venture in a second time.

Hens must be comfortable at all times, and must especially have quiet, clean, comfortable nests to encourage them to lay. I have tried both kinds of trap nests, and know by experience that the trap nest with two compartments is the best and most satisfactory to the hen and myself.

My trap nests are visited about once an hour during the morning, the attendant stopping only at those nests where the hen is waiting to come out; the door is opened, the hen taken up, her leg-band examined, and the number marked on the egg, the trap reset and the next one visited.

The hens become accustomed to this handling, and it makes them very tame. Tame hens lay much better than wild ones.

By means of trap nests you become better acquainted with the hens, easily discover any that may be getting too fat or otherwise, find out what hens go on the nest but do not lay, detect the egg eater, and so can thoroughly weed out all undesirable hens.

By means of the trap nest I discovered that I had some hens that laid almost every day, one hen only missing one day in a month, while one hen went on the nest day after day but only laid four eggs in a month, and one pullet was absolutely barren, never having laid an egg.

I have used trap nests for three years, and have learned many things from them. I do not see how anyone can afford to keep fowls without trap nests to weed out the unprofitable hens.—*American Exchange.*

PRESERVATIVES IN FOOD.

After deliberations extending over a period of two years, the departmental committee of the Local Government Board appointed to inquire into the use of preservatives and colouring matters in food has issued its report in the form of a Blue Book of imposing proportions. The question as to the extent to which the use of preservatives and colouring matters in food should be allowed is one which, being in the main a question of degree, has been, and must almost necessarily continue to be, the subject of a good deal of controversy, and it must not be supposed that that controversy can be determined by a report, however exhaustive, of the kind now issued. It can, however, indicate in a more or less authoritative way the point at which the use of the materials ordinarily employed for the preservation and colouring of food becomes injurious, and thus furnish a reliable basis for any future legislation that may be necessary. This is what the committee have endeavoured to do, and the result of their efforts is summarised in a series of recommendations, which appear to be at once moderate and practical.

The preservative agents most commonly used are comparatively few in number. They are boric acid and its compounds; sulphurous acid and sulphites; salicylic acid, and formalin or formaldehyde, the last-named substance being the only one the use of which, in the opinion of the committee, should be absolutely prohibited. It may also be noticed that farm produce is directly dealt with in three out of the seven recommendations, which are as follows :—

(*a.*) That the use of formaldehyde or formalin, or preparations thereof, in foods or drinks be absolutely prohibited, and that salicylic acid be not used in a greater proportion than 1gr. per pint in liquid food, and 1gr. per lb. in solid food. Its presence in all cases to be declared.

(*b.*) That the use of any preservative or colouring matter whatever in milk offered for sale in the United Kingdom be constituted an offence under the Sale of Food and Drugs Acts.

(*c.*) That the only preservative which it shall be lawful to use in cream be boric acid or mixtures of boric acid and borax, and in amount not exceeding 0·25 per cent. expressed as boric acid. The amount of such preservative to be notified by a label on the vessel.

(*d.*) That the only preservative permitted to be used in butter and margarine be boric acid or mixtures of boric acid and borax, to be used in proportions not exceeding 0·5 per cent. expressed as boric acid.

(*e.*) That in the case of all dietetic preparations intended for the use of invalids or infants, chemical preservatives of all kinds be prohibited.

(*f.*) That the use of copper salts in the so-called greening of preserved foods be prohibited.

(*g.*) That means be provided, either by the establishment of a separate court of reference or by the imposition of more direct obligation on the Local Government Board, to exercise supervision over the use of preservatives and colouring matters in foods, and to prepare schedules of such as may be considered inimical to the public health.

It is interesting, and also reassuring, to note with recommendation (*b*), that it is not the outcome of any evidence of injury caused to consumers by the presence of preservatives in milk, for the committee are unable to assert that any direct evidence of injury so caused has been brought before them. But having satisfied themselves, by the evidence of several extensive dairy farmers, that the milk industry can be carried on quite successfully without employing preservatives or colouring matters of any kind, they deem it expedient that, as a matter of public policy, and having regard to the fact that milk is a staple article of diet with children and invalids, the mixing of any quantity of preservative or colouring matter at all should be made an offence under the Sale of Food and Drugs Acts. It has been pointed out that if this recommendation becomes law, it will have the incidental effect of promoting cleanliness in dairies, because there is nothing so conducive to decomposition in milk as dirt, and the expedient of counteracting the probable effects of dirt in ill-kept dairies by the introduction of preservatives into the milk will be no longer possible. In the case of cream and butter, it is recommended that the only preservative allowed should be boric acid, or boracic acid, to the very limited extent of one-quarter per cent. in cream and one-half per cent. in butter, and to this is added the important suggestion that the presence of the ingredient should be notified by a label, thus giving the purchaser who is chary of swallowing even such a minute dose of extraneous matter an opportunity of declining the purchase. Recommendation (*f*) is aimed principally at the practice of greening of preserved fruits and vegetables, and in particular of tinned peas. With respect to this recommendation there is one dissentient on the committee, but the majority are of opinion that "serious and widespread mischief may result from the consumption of food and drink other than sweatmeats containing even minimal quantities of poisonous metallic substances," and they are accordingly of opinion "that such poisonous substances should be rigourously excluded."

Taken as a whole, the report tends to show that the ideas prevalent at the present time with regard to the extent to which food is adulterated with poisonous substances are to some extent exaggerated. But, on the other hand, there are good grounds for the belief that the Sale of Food and Drugs Acts, in their present form, are inadequate to deal with a practice which, as competition increases, might become a real source of evil. The merit of the recommendations proposed by the committee lies in the fact that, while safeguarding the consumer to a very considerable extent, they do not in any way seek to interfere with or oppose the legitimate interests of the producer.—London *Field*.

BUILDING UP THE HERD.

IT CAN ONLY BE ACCOMPLISHED WITH HOME-BRED STOCK.

Very few depend upon improving their dairy stock by breeding as much as by selection.

My experience of over 14 years breeding dairy stock exclusively convinces me that to obtain strictly first-class dairy cows one must breed them, and in doing so must exercise judgment based upon years of experience.

Too many farmers are milking cows and patronising creameries, depending as much for their profit upon the beef qualities of their cows as upon their daily milk yield. This is a great mistake, as has been proved in all strictly dairy countries. The cow yielding a profitable amount of milk and butter should be profitable enough in that line to enable the farmer who has milked her the years she is useful as a dairy cow to feed her carcass to his chickens and feel it no financial loss to him to do so.

It is possible that my ideal of a strictly first-class dairy cow is too high and too hard to obtain, but I think no farmer should be satisfied to milk a cow twice a day for years without knowing positively that her milk and butter yield pays him well for doing it. My standard has been not to be satisfied until I obtain the highest possible yield in milk and butter. I reason if an extra good cow does not pay me for milking her, then surely anything short of the best will not pay.

For over 15 years I have bred from sires whose dams have had butter records of not less than 18lbs. in seven days; yet with all that care in breeding I have not raised over six cows that were up to my ideal of first-class cows. Four of those I now have. I believe I am the only man in this county who has bred persistently for 15 years for the highest possible type of dairy cow. The query with me is, if I have produced so few standard cows in that length of time, how could I obtain as many if I depended on selections from farmers who have taken no pains in selecting sire?

One correspondent writes he has a grade two-year-old that produced in mid-winter 325lbs. of milk in seven days, from which he made 17½lbs. of butter. He also stated he had not used a sire for 11 years whose dam had a record of less than 18lbs. of butter in seven days. Most of us could figure pretty close upon our profits if we had a herd of 10 or 12 cows whose yield of milk and butter was equal to above.

There is only one way that such a herd can be produced, and that is by intelligent breeding and selection. Too few farmers are doing this. Too many are relying upon profit from the so-called "dual purpose cow." It is just as reasonable to try to aim at two birds not in line and kill them at one shot. Much is said about the dual purpose cow, but no one yet has been able to lay down a rule of breeding to produce that animal, or if such animal is found, how to produce her like. I am not fond enough of milking to be content to milk the dual purpose cow. I want the single purpose cow and want her to be the best intelligent care and breeding can produce.

There is no use in shutting our eyes to the fact that dairying is to be the leading industry in this section in the future. There is no place I know of better adapted to it, and no place where it can be carried on with more profit if we have the right kind of cows, and the right kind is the best to be obtained.—*Weekly Chronicle.*

A REMEDY FOR DREADED MITES.

The University of California agricultural experiment station has received from the United States Department of Agriculture an exhaustive report written by Entomologist C. L. Marlatt, embodying years of investigation and research into the problem of the native home and natural enemy of the dreaded San José scale. The studies of the Government expert have thrown a flood of light on the history of the introduction of the insect scourge, and have relieved California of the onus of having been the original home of the now famous pest. Moreover, the entomologists have discovered a ladybird which will prove the undoing of the San José scale when it is fairly introduced into America.

Entomologist Marlatt started in his search for the native home of the scale by making careful studies of the rare trees now in San José, which the late James Lick imported from the Orient in the seventies, and on which the pernicious insect was first noted. The exact place whence these ornamental plants had been purchased was not known. Hawaii, Japan, and even Australia had the scale, but in every case it was found that the insect had entered these countries through the introduction of California trees and plants. The same had already been proved in the case of European countries. The last country to be explored was China, and in the northern and north-western frontier of China proper, in a fairly well shut-off region, the insect was discovered in its native habitat. On the flowering Chinese peach and other deciduous fruit trees the little mite was found, and here, it was proved, the insect started on its destructive travel around the world. It is supposed to have been brought to California by James Lick, in an importation of fancy fruit trees, a horticultural experiment in which he was assisted by the late Dr. Nevius, the distinguished missionary of Chefoo, who did such a remarkable work in stimulating the fruit-growing industry in that region.

Having traced the San José scale to its home and proved that its name should truthfully be the "Chinese scale," Entomologist Marlatt next looked for some beneficial native insects which might control the scale. He discovered a ladybird *(chilocorus similis)* which was everywhere present, feeding industriously on the scale, preferring it to any other mite. A number of these beetles were promptly brought to America, and, after a number of vicissitudes, successfully bred in the experimental gardens at Washington, D. C. The San José scale is the normal and natural food of these ladybirds. The latter multiply rapidly, and the larvæ, eating practically all the time, destroy enormous numbers of the pest in a day. Unless predaceous insects or parasitic enemies combat it, the Chinese ladybird is expected to be a very powerful factor in keeping the San José scale in check, so that it will be no more troublesome than native scale pests.—*Exchange.*

THE BEE MOTH.

Worst Enemy of the Honey Bee barring ignorant Beekeepers.

It is very likely that the moth worm is, as has been so often stated, the worst enemy the honey bee has—if we except ignorant beekeepers; but if such is the case we can consider ourselves very fortunate, for the moth is almost no enemy at all to one who is well posted and up with the times. When you hear a person complaining that the moth worm killed his bees you can set him down at once as knowing very little about bees; and if a hive is offered you that has an attachment or trap to catch or kill moths you can set the vendor down as a vagabond and swindler. You can scarcely plead ignorance for him, for a man who will take upon himself the responsibility of introducing hives without knowing something of our modern books and bee journals should receive treatment sufficiently rough to send him home or into some business he understands.

When a colony gets weakened so much that it cannot cover and protect its combs, robbers and moth worms help themselves as a natural consequence, but either rarely does any harm if there are plenty of bees and a clean tight hive. If a hive is so made that there are crevices which will admit a worm, and not allow a bee to go after it, it may make some trouble in almost any colony, and I cannot remember that I ever saw a patented moth-proof hive that was not much worse in this respect than a plain, simple box hive; a plain, simple box is, in fact, all we want for a hive, but we must have frames to hold them, and if these frames are made so that bees can get all around and about them, we have done all we can to make a moth-proof hive.

Of course, colonies will at times get weakened; and with the best of care, with the common bees especially, worms will sometimes be found in the combs. Now if you have the simple hive, I shall recommend, you can very quickly take out the combs, and with the point of your knife remove every web and worm, scrape off the debris and assist the bees very much. If there is any accumulation of filth on the bottom board, lift out all the combs and brush it all off, and be sure you crush all the worms in this filth, for they will crawl right back into the hive, if carelessly thrown on the ground.

If you keep only Italians, or even all hybrids, you may go over a hundred colonies and not find a single trace of a moth worm. At the very low price at which Italian queens are now purchased, it would seem that we are very soon to forget that a bee moth ever existed; and the readiest way I know of to get combs that are badly infested free from worms is to hang them, one at a time, in the centre of a full hive of Italians. You will find all the webs and worms strewn around the entrance of the hive in a couple of hours, and the comb cleaned up nicer than you could do it if you were to sit down all day to the task.

FERTILISERS FOR ORANGES.

EXPERIENCE GAINED BY FLORIDA GROWERS.

The orange growers in the Florida hammocks have changed the character of their fruit. Fertilizer formulas, studied and tested for years by a class of growers inferior to none in this country, have been perfected. It was an absolute necessity they were under for the amount of stable manure in the State was insufficient for a hundred groves, and even the time honoured system of cow-penning was wholly inadequate.

At first, commercial fertilizers were applied with misgivings, blindly. As late as 1883, a work on orange-culture by A. H. Manville said: "They may be adapted to the production of annual crops, but are too stimulating and concentrated to be applied to orange trees." So rapidly was the progress of these fertilizers, that in a few years the author recalled the book and burned it. Like our Northern brethren, like the Fruit Culturist, he had advocated composts, but these were soon relegated to the rear. Among the members of the State Horticultural Society, composts became as much out of date as an ox-cart.

The cotton-growers were familiar with Peruvian guano, with cottonseed and Carolina phosphate, but they ran aground on potash. They were afraid it would burn something. The earliest orange-growers used it only in the form of "hardwood ashes" from Canada, and an enormous trade was done in spurious ashes for years.

The advocates of pure chemical fertilizers—"canned goods" their enemies call them—made headway with difficulty. The conservative and the homespun continually reverted to composts, to muck and leaves. For years the battle over muck was waged in the State Horticultural Society, until at last the mere mention of the word would excite a ripple of laughter. An able member, in a brilliant essay, characterised the carting of muck as a "harmless amusement," which no man whose time was worth anything could afford to engage in. The sarcasm stuck; muck has been laughed out of court.

In 1890 it was thought a daring thing when a successful grower declared that he used 10 per cent. of potash. In 1892 another orange grower, one of the ablest in the State, judged by results, told me he would not have stable manure on his grove as a gift; he would put it on corn and beans, but in his grove he wanted only pure chemicals.

In 1894 a Chinese at De Land, a very intelligent grower, told me he applied the normal formula, and then added enough potash to double the amount, thus giving his trees 25 to 28 per cent. His oranges were wonderfully fine; bright, with a thin, silky, tough peel, sweet and of a delicate boquet; so densely packed with juice that when cut open the juice would spurt out under the knife.

Early in the use of potash, the orange growers turned against the muriate and against kainit. The leader in this practice was decided in his opinion that sulphur is the controlling principle which promotes the conversion of starch into sugar. He observed that a few of his trees which were watered by the overflow of sulphur water from his artesian well ripened their fruit a month earlier than the others and bore sweeter fruit. For the same reason, in part, the sulphate of ammonia is preferred to the nitrate of soda as a source of nitrogen.

The advocates of pure chemical formulas discard cottonseed meal and organic nitrogen compounds, such as blood and bone, linseed meal, castor pomace, though these are permitted by the less fastidious. Even Florida phosphate rock is rejected. The gilt-edge formula reads: "Sulphate of ammonia, sulphate of potash, bone black, or dissolved bone."

The result of this rigid rejection of organic matter is an orange which, even when grown in the hammock, will carry with only 1 or 2 per cent. of decay, often without any, where formerly it showed 25 to 75 or more. A beautiful, thin-skinned fruit, without crease or blemish, of the highest quality in juice characteristics, and readily commanding from 15s. to £1 a box.

GARDEN NOTES FOR NOVEMBER.

By Percy G. Wicken.

The late rains experienced this spring, although they will have the effect of delaying the growth of plants in the gardens, will enable settlers to cultivate supplies of vegetables through the summer. The ground, having had a thorough soaking, will, if kept well cultivated, retain a good supply of moisture during the hot summer months. Water is plentiful in all the South-West portions of the State; rivers and creeks, which have not run for years, are now flowing strongly, and this should impress on settlers the necessity for taking steps to conserve the water which is now running to waste. A great quantity of this water could be conserved by tanks and dams, which could be made in selected sites at very little expense; and after a season, such as the present, it should be easy to mark the spots where the best catchment for a dam occurs. The hand or horse-hoe should be kept going between the rows of vegetables to keep the ground well stirred; this causes the surface soil to act as a mulch, and prevents the evaporation of moisture from the subsoil. The weeds should be kept cut down to prevent them from seeding. As the weather becomes drier a mulching of stable manure, bush rakings, straw, and other suitable material should be placed on the surface and round the trees to help keep the moisture round the roots. If putting out young plants, the ground should be worked as deeply as possible, and the young plants shaded by means of bushes, strips of bark, old shingles, or any other material that can be obtained. Where water is available for irrigation, furrows should be made between the rows and the water run down the furrows; the water should not be allowed to run round the stem of a plant. One good soaking gives better results than three or four small waterings.

BEANS (French or kidney).—Generally do well all through the summer if there is sufficient moisture in the soil to keep them going. A top dressing of sulphate of potash applied just before the plants come into flower will have a beneficial effect on the crop. It is best applied in a liquid form if it is possible to do so, say, 1 ounce to 1 gallon of water. If this is not possible the sulphate should just be dusted along the rows and raked in.

BEANS (Lima).—May still be planted; they are well worth cultivating, and stand the dry weather well. Sow in rows 3 feet apart, and about 6 inches apart in the rows. The seeds only are eaten the same as peas.

BEANS (Madagascar).—These beans should now be well forward and ready for staking or trellising.

BEET (Red).—Sow a little seed of the Globe variety. They are very acceptable during the summer.

BEET (Silver).—The green leaves of this plant are always acceptable as a vegetable; the outside leaves should be used first, as a fresh supply comes from the centre.

CABBAGE.—Plant out any young plants that you may have; they should be planted in well-worked and heavily-manured land. If the grubs are troublesome they should be sprayed with a mixture of Paris-green and water, 1 ounce to 10 gallons of water. Make the Paris-green into a paste before adding the water.

CARROTS.—A few rows may be sown to keep up a supply.

CELERY.—Sow a little seed in a box or bed for future use. The young plants require to be planted out in a well-manured bed. They should be planted in trenches and then kept well hilled up.

CHOKO.—This vegetable is well worth a trial; they are very prolific. The vines can be trained to grow over any fence. The fruit itself is planted, and shoots out from the stem. It is a rapid grower.

CUCUMBER.—Early sown plants will now be giving cucumbers ready for market. Thin out those already up and sow a few more for future use.

EGG PLANT.—The young plants should now be ready for planting out.

Maize (Sweet).—Sow a few rows two feet apart, and about nine inches apart in the rows. The sweet maizes are mostly of dwarf habit of growth. Sweet maize makes a welcome addition to the table.

Melons.—The land between the hills should be kept well worked until the vines begin to run. In the cooler localities a few more hills should be sown.

Okras.—A few seeds may be sown, and any plants already up should be planted out. They are useful for pickling and for show purposes.

Pumpkin and Squashes.—Some of the earlier bush varieties will be ready for cutting this month ; a few more hills may be planted out. The Rio or Bugle pumpkin is the best to sow this month, they are good for table and preserves, and also an excellent fodder. Pinch back all vines that are growing too rambling.

Sweet Potatoes.—Those who have placed the tubers in a bed, as described in previous issues of the *Journal*, should have plenty of shoots for planting out; they should be planted out as early as possible, as it is harder to get them to strike in the hot weather. They should be planted on ridges.

Tomatoes.—Early plants should now be doing well, and in many parts of the State a few ripe tomatoes will be available. They are a very wholesome fruit, and as many plants as possible should be put out; there is always a good market. They are gross feeders and require a liberal supply of manure. Stable manure is the best if available, if not, a manure rich in nitrogen and potash must be supplied. They will yield better if tied to stakes than if allowed to run over the ground.

Farm.—This is a busy month on the farm. In most districts hay-making will be partly over or in full swing. Growers should well consider whether it is advisable to cut too much for hay. There is a considerable quantity of hay still in this State from last season, and everything points to a bountiful harvest, and the price of chaff will probably be low. Although owing to the late season the risk from fire will not be so great this season, still it will be necessary to take precautions against an outbreak. Those who intend to leave their wheat for grain would do well to cut a headland all round the paddock for hay, and then run the plough or cultivator round this strip which will then make a good fire-break. Reapers and strippers should be put in order, and any duplicate parts likely to be required should be ordered so that no delay may take place when ready to start operations. If the ground is not too dry, cow-peas, soy-beans, velvet-beans, millets and sorghum may be sown for summer feed, and in the moister localities maize may be sown for fodder.

The Climate of Western Australia during September, 1903.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						September, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
North-West and North Coast:	Wyndham ...	29·916	29·961	30·079	29·685	94·5	75·9	85·2	103·0	69·6	94·6	74·6	103·5	65·0	*Nil*	4554
	Derby	29·946	29·975	30·098	29·791	94·0	64·0	79·0	103·0	55·0	94·7	65·4	103·0	54·5	*Nil*	2187
	Broome ...	29·948	29·986	30·095	29·793	87·3	64·5	75·9	100·5	56·0	89·0	64·6	101·0	54·8	*Nil*	1608
	Condon ...	29·968	30·016	30·135	29·797	83·4	54·2	68·8	96·1	44·0	86·0	56·3	98·8	42·0	*Nil*	925
	Cossack ...	29·985	30·031	30·186	29·821	85·7	57·8	71·8	92·5	50·2	86·8	61·6	98·2	51·8	1	917
	Onslow ...	30·035	30·030	30·270	29·860	81·0	53·0	67·0	90·0	44·0	84·6	56·6	101·0	43·5	3	626
	Carnarvon ...	30·052	30·087	30·313	29·816	73·9	56·2	65·0	86·0	46·0	75·4	56·6	95·7	43·0	63	1213
	Hamelin Pool...	30·035	30·086	30·320	29·780	73·0	51·0	62·0	84·0	42·0	77·8	52·0	96·8	40·0	91	722
	Geraldton ...	30·042	30·122	30·375	29·715	68·9	52·9	60·9	80·5	41·5	71·3	51·7	94·0	39·0	354	2261
Inland:	Hall's Creek *	29·971	30·004	30·217	29·731	93·3	57·0	75·2	100·4	45·6	93·3	61·0	99·8	42·2	*Nil*	3127
	Marble Bar ...	...	...	...	...	90·1	57·2	73·6	101·3	42·0	...	...	...	...	1	655
	Nullagine * ...	29·978	30·022	30·313	29·755	87·2	51·8	69·5	98·5	40·0	88·1	54·6	98·5	38·9	*Nil*	662
	Peak Hill ...	30·005	30·057	30·370	29·650	75·0	51·0	63·0	89·8	42·0	78·5	53·0	91·0	38·1	25	499
	Wiluna. ...	29·991	...	30·385	29·617	75·4	47·8	61·6	92·5	39·3	...	...	...	...	16	729
	Cue	30·037	30·086	30·393	29·758	72·4	49·7	61·0	85·2	39·0	77·2	49·9	93·2	37·0	42	552
	Yalgoo ...	29·995	30·095	30·350	29·730	70·8	47·0	58·9	85·0	36·0	75·6	47·4	93·6	35·9	33	593
	Lawlers ...	30·010	30·076	30·418	29·674	72·1	47·7	59·9	89·2	38·1	75·1	48·7	95·2	34·7	*Nil*	862
	Laverton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Menzies ...	30·005	30·082	30·420	29·690	70·4	47·3	58·8	87·0	37·0	73·1	68·1	92·1	33·5	41	1261
	Kanowna ...	...	...	...	...	68·2	45·7	57·0	87·5	36·8	...	...	...	...	73	979
	Kalgoorlie ...	29·992	30·094	30·413	29·603	69·4	46·7	58·0	87·7	37·9	71·8	48·3	90·8	34·9	59	967
	Coolgardie ...	29·970	30·100	30·409	29·592	68·6	45·8	57·2	87·8	37·9	71·6	46·8	92·0	35·0	60	771
	Southern Cross	29·968	30·080	30·405	29·618	69·4	44·0	56·7	84·4	33·4	71·8	43·8	88·1	31·0	112	695
	Walebing ...	...	...	...	...	65·0	44·5	54·8	77·2	34·0	...	...	...	...	422	2067
	Northam ...	...	...	...	...	66·1	45·4	55·8	78·0	36·0	...	...	...	...	506	1562
	York	29·990	30·116	30·430	29·610	65·0	45·0	55·0	77·0	35·0	68·8	42·6	84·7	31·8	537	1441
	Guildford ...	...	...	...	...	65·1	47·8	56·4	78·0	37·0	...	...	...	...	923	3188

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during September, 1903—*continued.*

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						September, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:	Perth Gardens ...	29·998	30·098	30·433	29·566	65·7	50·1	57·9	76·0	41·2	68·6	49·5	89·0	35·0	798	3137
	Perth Observatory	30·009	30·122	30·445	29·571	63·9	49·8	56·8	75·9	41·1	66·4	50·4	86·4	39·0	772	3152
	Fremantle ...	30·029	30·115	30·456	29·578	62·8	52·1	57·4	71·5	42·0	65·0	52·8	84·0	42·0	655	2950
	Rottnest ...	29·979	30·108	30·413	29·505	62·8	53·0	57·9	70·0	47·0	64·7	53·9	83·0	42·6	456	2738
	Mandurah ...	...	...	...	...	63·8	55·5	59·6	73·1	43·0	...	...	...	...	759	3319
	Wandering ...	...	...	...	...	...	...	...	...	...	...	...	...	...	673	2505
	Collie	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Donnybrook ...	...	...	...	...	62·6	51·1	56·8	74·2	41·8	...	...	...	...	737	3294
	Bunbury ...	29·970	30·114	30·400	29·530	62·0	48·0	55·0	71·0	37·0	65·6	49·6	83·8	32·2	629	3986
	Busselton ...	...	...	...	...	61·8	47·7	54·8	66·0	38·0	...	...	...	...	558	2758
	Cape Naturaliste	...	...	...	...	61·4	50·6	56·0	67·0	42·0	...	...	...	...	346	...
	Bridgetown ...	...	...	...	...	61·9	42·0	52·0	72·0	32·0	...	...	...	...	758	2962
	Karridale ...	29·917	30·100	30·382	29·472	62·0	49·8	55·9	71·5	38·5	63·4	48·6	82·5	31·5	473	3466
	Cape Leeuwin ...	29·875	30·050	30·400	29·180	61·4	54·8	58·1	72·1	46·1	62·8	53·8	79·5	43·8	322	2413
	Katanning ...	29·950	30·090	30·400	29·550	60·7	43·6	52·2	71·0	34·0	64·6	43·6	81·1	29·8	484	1941
	Albany	29·900	30·065	30·388	29·160	62·3	44·3	53·3	73·5	38·2	63·8	47·7	84·8	34·0	512	3257
	Breaksea... ...	29·895	30·062	30·370	29·240	60·0	49·6	54·8	71·0	42·2	61·4	50·8	84·2	40·0	429	2428
	Esperance ...	29·936	30·078	30·395	29·435	65·3	47·4	56·4	78·5	37·5	66·8	48·5	86·6	35·2	422	2097
	Balladonia ...	29·969	...	30·410	29·530	67·8	44·5	56·2	84·1	35·0	...	...	...	...	133	718
	Eyre*	29·944	30·094	30·444	29·632	68·7	46·8	57·8	85·6	31·2	67·8	46·9	90·2	33·6	83	1010
INTER-STATE.																
	Perth	30·009	30·122	30·445	29·571	63·9	49·8	56·8	75·9	41·1	66·4	50·4	86·4	39·0	772	3152
	Adelaide	29·952	30·071	30·371	29·426	66·2	45·5	55·8	81·2	40·1	66·5	47·9	90·7	32·7	285	...
	Melbourne	29·924	29·922	30·266	29·566	62·7	47·5	55·1	80·2	34·4	62·6	45·4	74·5	35·6	318	...
	Sydney	30·000	30·047	30·260	29·380	63·0	53·0	58·0	85·0	44·0	66·3	51·4	89·8	40·8	433	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
7th October, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for August, 1903 (completed as far as possible), and for September, 1903 (principally from Telegraphic Reports).

STATIONS.	AUGUST.		SEPTEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EAST KIMBERLEY:				
Wyndham ...	Nil	...	Nil	...
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek ...	Nil	...	...	...
Plympton, St. Mary	...	...	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	Nil	...	Nil	...
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	...	...	...	...
WEST KIMBERLEY:				
Obagama ...	...	...	...	...
Beagle Bay ...	...	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	...	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	Nil	...	...	...
Thangoo	...	...	...	...
La Grange Bay...	Nil	...	...	...
NORTH-WEST:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	Nil	...
DeGrey River ...	...	...	...	...
Port Hedland ...	Nil	...	1	1
Boodarie ...	...	...	...	...
Warralong ...	...	...	...	...
Muccan	...	...	...	...
Ettrick	...	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	...	...	...	...
Pilbarra	Nil	...	Nil	...
NORTH-WEST—*cont.*				
Coongon	...	...	...	...
Warrawagine ...	...	...	...	...
Bamboo Creek ...	Nil	...	Nil	...
Marble Bar ...	Nil	...	1	1
Warrawoona ...	...	...	...	...
Corunna Downs...	...	...	...	...
Nullagine ...	Nil	...	Nil	...
Yandicoogina ...	...	...	...	...
Kerdiadary ...	...	...	...	...
Roy Hill	...	...	...	...
Mosquito Creek	...	...	...	...
Mulga Downs ...	...	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	...	...	...	...
Tambrey ...	...	...	...	...
Millstream ...	...	...	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	Nil	...	Nil	...
Cooyapooya ...	Nil	...	...	...
Woodbrooke ...	...	...	...	...
Croydon	...	...	...	...
Balla Balla ...	Nil	...	Nil	...
Roebourne ...	Nil	...	Nil	...
Cossack	Nil	...	1	1
Fortescue ...	Nil	...	...	...
Mardie	Nil	...	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	Nil	...	...	...
Onslow	3	1	3	1
Peedamullah ...	...	...	...	...
Red Hill	...	...	...	...
Mt. Mortimer ...	...	...	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	...	...	...	...
Yanrey	...	...	...	...
Point Cloates ...	...	...	...	...
GASCOYNE:				
Winning Pool ...	...	...	31	2
Towara	...	...	...	...
Ullawarra ...	...	...	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	...	...	...	...
Bangemall ...	...	...	...	...
Bernier Island ...	70	6	...	...

RAINFALL—*continued.*

STATIONS.	AUGUST.		SEPTEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Boolathana ...	94	4	...	...
Carnarvon ...	134	5	63	3
Cooralya	...	...	...	...
Doorawarrah ...	...	...	...	...
Mungarra ...	57	4	...	...
Clifton Downs ...	...	...	...	...
Dairy Creek ...	...	...	...	...
Upper Clifton Downs	...	...	...	...
Errivilla	17	2	...	...
Dirk Hartog Island	...	...	...	...
Sharks Bay ...	90	3	...	...
Kararang ...	...	...	...	...
Meedo	130	5	...	...
Tamala	...	...	...	...
Wooramel ...	194	5	105	7
Hamelin Pool ...	86	5	91	5
Byro	76	4	...	...
Yarra Yarra ...	144	5	...	...
Berringarra ...	58	5	...	...
Mt. Gould ...	35	2	...	...
Moorarie ...	34	2	...	...
Wandary... ...	31	2	...	...
Peak Hill ...	11	2	25	2
Horseshoe ...	17	2	21	2
Mount Frazer ...	13	1	...	...
Abbotts	53	3	76	3
Belele	47	3	79	2
Milly Milly ...	74	4	...	...
Manfred ...	107	6	...	...
New Forest ...	160	5	...	...
Twin Peaks ...	172	5	...	...
Billabalong ...	108	4	...	...
Wooleane ...	118	5	...	...
Murgoo	149	6	...	...
Meeka	112	6	...	...
Mt. Wittenoom ...	126	6	...	...
Nannine	42	3	114	3
Star of the East ...	44	3	114	3
Annean	20	1	62	3
Tuckanarra ...	121	7	46	3
Coodardy ...	71	5	...	...
Cue	123	7	42	6
Day Dawn ...	82	4	41	4
Lake Austin ...	94	6	41	5
Lennonville ...	110	6	101	7
Mt. Magnet ...	114	6	103	4
Challa	81	4	43	2

STATIONS.	AUGUST.		SEPTEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Murrum	131	3	11	3
Barnong	208	6	130	7
Yalgoo	120	5	33	4
Wagga Wagga ...	136	5	87	7
Gabyon	152	4	...	...
Wurarga ...	133	4	...	...
Gullewa	185	5	126	8
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	362	10	...	...
Mount View ...	294	6	...	...
Mumby	322	9	384	16
Northampton ...	442	8	454	16
Mt. Erin ...	359	9	410	12
Oakabella ...	460	10	...	...
Narra Tarra ...	474	10	...	...
Tibradden ...	467	7	...	...
Sand Springs ...	351	8	...	...
Mullewa... ...	263	8	321	13
Kockatea ...	346	9	312	11
Bootenal ...	375	6	...	...
Geraldton ...	409	11	354	18
Greenough ...	612	11	486	15
Dongara ...	416	9	352	16
Dongara (Pearse)	368	8	339	14
Nangetty ...	238	5	...	...
Mingenew ...	293	11	301	19
Urella	279	9	275	16
Yandenooka ...	386	9	359	15
Rothesay ...	189	7	...	...
Field's Find ...	111	6	...	...
Carnamah ...	322	10	252	15
Watheroo ...	297	14	298	17
Dandaragan ...	418	13	576	17
Moora	391	10	392	15
Yatheroo ...	449	13	624	12
Walebing ...	410	11	422	17
New Norcia ...	381	13	552	16
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	853	15	873	16
Belvoir	760	14	768	18
Mundaring ...	917	16	1100	20
Guildford ...	787	15	923	22

RAINFALL—*continued.*

STATIONS.	AUGUST.		SEPTEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN—*continued.*				
Canning W't'r'w'ks	705	12	613	17
Perth Gardens	881	17	798	21
Perth Observatory	925	17	772	20
Subiaco	883	17	683	20
Claremont	860	15	674	17
Fremantle	751	17	655	21
Rottnest	681	18	456	21
Armadale	907	16	764	20
Rockingham	719	15	697	19
Canning River	1130	13	1112	19
Jarrahdale	1106	12	1232	20
Mandurah	709	13	759	21
Pinjarra	801	14	...	...
Yarloop	854	16	897	23
Harvey	723	15	978	21
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley	221	9	...	...
Momberkine	237	8	...	...
Monglin	303	13	315	16
Newcastle	403	12	557	14
Eumalga	402	14	634	17
Northam	302	10	506	13
Grass Valley	236	10	379	14
Meckering	180	11	273	16
Cunderdin	194	12	303	14
Codg-Codgen	157	12	221	18
Yarragin	192	9	...	...
Doongin	189	10	239	12
Cuttenning	189	13	262	17
Whitehaven	241	13	361	20
Sunset Hills	258	11	465	16
Cobham	328	16	576	17
York	277	14	537	19
Beverley	314	10	477	15
Barrington	237	11	426	17
Stock Hill	339	10	...	...
Sunning Hill	375	11	449	16
Wandering	635	12	673	18
Glen Ern	421	14	534	20
Pingelly	345	9	446	16
Woogenellup	275	15	392	20
Marradong	606	12	682	18
Bannister	618	14	...	...
Narrogin	313	12	439	18
SOUTH-WEST—*contd.*				
Wickepin	401	12	...	...
Gillimaning	330	14	343	18
Bunking	254	8	...	...
Bullock Hills	223	10	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury	885	15	629	20
Collie	621	16	...	...
Glen Mervyn	677	14	...	...
Dardanup	759	14	807	19
Donnybrook	674	17	737	19
Boyanup	760	16	757	20
Ferndale	680	19	780	17
Busselton	622	21	558	22
Quindalup	675	21	623	21
Cape Naturaliste	...	...	346	20
Lower Blackwood	1023	23	...	...
Karridale	767	27	473	23
Cape Leeuwin	567	28	322	26
Biddellia	746	22	...	...
The Warren	818	19	...	...
Lake Muir	447	20	558	20
The Peninsula	594	24	782	25
Mordalup	442	17	...	...
Deeside	452	23	663	20
Riverside	445	22	646	18
Balbarup	535	17	646	22
Wilgarup	527	19	699	22
Mandalup	668	16	...	...
Bridgetown	566	23	758	23
Westbourne	495	19	558	21
Hilton	523	10	441	13
Greenbushes	660	15	...	...
Greenfields	507	10	744	19
Glenorchy	447	12	...	...
Williams	428	16	441	20
Arthur	302	9	387	14
Darkan	444	9	378	12
Wagin	267	10	371	15
Glencoe	234	14	388	17
Dyliabing	194	12	337	18
Katanning	314	14	484	22
Kojonup	430	14	554	20
Broomehill	375	11	831	20
Sunnyside	203	14	380	21
Woodyarrup	268	15	384	19
Cranbrook	197	13	480	20

RAINFALL—*continued.*

Stations.	August.		September.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*				
Blackwattle	316	11	...	...
Mt. Barker	336	15	474	22
Kendenup	272	16	523	20
St. Werburgh's	279	18	...	...
Forest Hill	416	20	490	21
Denmark	675	20	...	...
Grasmere	616	23	525	23
Albany	611	22	512	23
King River	...	...	414	18
Point King	746	20	418	16
Breaksea	538	22	429	20
Wattle Hill	329	9	603	16
Cape Riche	269	10	...	...
Pallinup	207	12	369	15
Bremer Bay	373	16	370	20
Jarramongup	138	9	...	...
EASTERN DIVISION:				
Dural	16	2	27	2
Lake Way	12	3	16	2
Gum Creek	52	3	...	...
Mt. Sir Samuel	28	4	12	1
Lawlers	39	4	Nil	...
Leinster G.M.	60	4	21	1
Lake Darlôt	18	2	...	...
Mt. Leonora	37	4	3	1
Mt. Malcolm	26	3	Nil	...
Mt. Morgans	10	2	...	...
Laverton	21	2	...	...
Murrin Murrin	30	4	...	...
The Granites	18	2	19	4
Tampa	21	1	...	...
Kookynie	65	4	20	4
Niagara	55	3	2	1
Yerilla	62	4	16	5
Edjudina	47	4	...	...
Menzies	67	6	41	3
Mulline	117	5	...	...
Waverley	73	6	43	6
Goongarrie	50	4	...	...
Mulwarrie	114	6	68	10
Bardoc	...	...	47	2
Kurawa	58	5	95	5
Kurnalpi	48	5	35	4
Bulong	62	5	55	6

Stations.	August.		September.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EASTERN—*contd.*				
Kanowna	61	5	73	7
Kalgoorlie	82	5	59	8
Coolgardie	65	4	60	11
Burbanks P.O.	75	5	43	6
Woolubar	55	4	...	...
Widgiemooltha	35	4	84	9
50-Mile Tank	38	4	86	8
Waterdale	47	4	59	9
Norseman	32	4	43	5
Lake View	67	5	69	9
Bulla Bulling	71	4	...	...
Woolgangie	87	5	102	6
Boondi	...	...	107	10
Boorabbin	76	5	133	12
Koorarawalyee	...	...	128	9
Karalee	118	5	147	8
Yellowdine	94	6	171	9
Southern Cross	75	8	112	12
Parker's Road	129	8	88	4
Mt. Jackson	96	5	...	...
Bodallin	91	5	150	6
Burracoppin	121	5	155	6
Kellerberrin	170	10	283	13
Merredin	...	...	185	8
Mangowine	185	11	201	15
EUCLA DIVISION:				
Ravensthorpe	103	8	190	16
Coconarup	120	11	...	...
Hopetoun	189	12	231	17
Fanny's Cove	602	12	...	...
Park Farm	519	15	387	20
Esperance	487	18	422	17
Gibson's Soak	315	13	...	...
30-Mile Condenser	204	12	...	...
Swan Lagoon	129	9	...	...
Grass Patch	116	10	171	17
Myrup	486	17	487	18
Lynburn	471	14	418	14
Boyatup	589	19	...	...
Point Malcolm	294	14	349	17
Israelite Bay	158	9	232	11
Balladonia	46	7	133	9
Eyre	70	8	83	10
Eucla	56	4	50	7

The Observatory, Perth,
7th October, 1903.

W. E. COOKE,
Government Astronomer.

By Authority: WM. ALFRED WATSON, Government Printer, Perth.

JOURNAL

OF THE

Department of Agriculture

OF

WESTERN AUSTRALIA.

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NOTES.

OUR WHEAT CROP.—It is many years since the indications at present existing for a bountiful harvest has been seen in this State. From the North to the South, and even in the East, on our goldfields the crops look splendid. A sample of wheat grown at Menzies was exhibited at the late York show, and may be said to be an unusually fine specimen. Certainly wheat will be cheap this year, but then the quantity and quality will make up any difference to the farmer, so that the lower rates will not be felt by him.

RAMIE FIBRE.—The following notes on the way to cultivate ramie fibre will be of use to many of our readers, as we understand that several settlers intend to give this plant a trial this year. Sow in boxes or pans very thinly, cover the seed lightly, and pack firm and give plenty of drainage, as the young plants are apt to rot if crowded or kept too wet. Protect from direct rays of the sun and keep moist. Prick out the young plants when large enough into boxes, giving them a space of about three inches to each plant. When six or eight inches high plant into well-prepared beds, protecting until plants are well established. Encourage lateral shoots to grow, which, when layered and pegged down, will readily strike, and can then be severed from the parent plant and set out.

FIGHTING WEEDS.—We read in Grecian mythology of a contest between Hercules and the giant Antæus, son of mother Earth, and famed for his strength and skill in wrestling. Although Hercules was able to throw his antagonist to the ground, from each fall Antæus would rise from mother Earth stronger than before. Hercules finally killed him by lifting him from the ground and squeezing him to death. The struggle of the farmer to free his fields from the domination of noxious weeds has been appropriately likened to that of the Greek fable. Everyone who is interested in agriculture knows well the great extent to which weeds exist in our cultivated lands. Hitherto our farmers have been about as successful in their fight against weeds as Hercules was in the earlier stages of his contest with Antæus. They have been fighting away blindly, treating all kinds of weeds in the same way, with the result that some weeds are killed, some are merely kept in check, and some flourish and increase. If they are ever to be eradicated entirely, their habits of growth, their strong and weak points, must be studied by the cultivators of the soil, even as Hercules studied the weakness of his adversary. During the last year or two a great deal has been done by the Agricultural Departments through the medium of newspapers, bulletins, and agricultural meetings to disseminate information on this subject. The process of education, however, is necessarily slow, and it seems to be the general opinion of progressive farmers, as revealed by the farmers' institute meetings all over the country, that the time has come when a herculean effort must be made to lift this giant of "weed domination" from the earth and destroy it.—*Exchange.*

AGRICULTURE ON THE GOLDFIELDS.—For some time our eastern goldfields have been described as a howling wilderness of sand and spinifex. This is now being changed into smiling cornfields and luxuriant gardens. The following extracts, taken from a letter to the Hon. the Minister, written by a gentleman who visited the first local Agricultural and Horticultural Show held on the goldfields, which took place at Menzies on the 14th of last month, provides very interesting reading:—"You would be glad to hear that the Menzies show was a complete success in every respect, and the society promises to be a valuable institution. A report of the show, taken from the *North Coolgardie Herald*, is enclosed, and I trust that it may be of interest to you. I may mention, as a farther interesting fact, that wheat and oats grown in the Menzies district were sent to compete at the York show, the exhibitor being Mr. J. W. Rayfield, manager of the Lady Shenton mine. I have seen nothing in the Perth Press with reference to these exhibits, but can only say that if they did not receive the first prize there must have been some exceptionally fine samples displayed. While on subjects connected with the utilisation of the land, it may be of interest to you to know that cattle bred in the Menzies district are now being killed by a local butcher. He has 150 head of cattle grazing about Menzies—nearly all in prime condition—and is bringing an additional 300 head to the district very shortly. He has also about 500 head of sheep, which have fattened locally, and are in prime condition. Yet another point of interest is the arrival in Menzies of the first reaper and binder brought to the goldfields. This machine came to hand a few days ago, and is engaged reaping a crop of 35 acres of wheat, the owner of which is Mr. Gus. Schmidt."

HARVEST NOTES IN FRANCE AND ALGERIA.

By A. Despeissis.

[Mr. Despeissis, the Horticultural and Viticultural Expert of the Department, has forwarded the following notes on his travels in Algeria and Spain. They are most interesting, and give promise of a greater treat in store when he returns. His observation of Viticulture will be of the greatest possible value to our vignerons, who should lose no opportunity in order to benefit by the experience gained by Mr. Despeissis, and which will be placed at their disposal in ample time for next season's operations.—Ed. *Journal*.]

Since writing last, the season, which throughout had proved particularly nasty so far as France is concerned, has, instead of mending, proved most disastrous. The May frosts and June downpours, which cut back vineyards and orchards and blighted the blossoms, have been followed up by showery weather, which helped along the cornfield, but disseminated blights and rots amongst the vines and fruit trees. From week to week for some time past the vintage forecast has been reduced, but since I left for Algeria I hear that most destructive hailstorms have swept over France and reduced to a pulp what was left of the grape crop in many localities, whilst the corn, which in the North of France is not all harvested yet, is rotting in the fields and sprouting in the shooks.

In other places, what frost, wet, and hail have not more or less damaged the crops have to contend with fungus diseases, so that altogether the vintage which will commence in a week or so is merely the shadow of that which was expected, whilst the corn harvest is already utterly spoilt.

It is indeed fortunate for France that she owns within sight of her shores such colonies as Algeria. Nature has this year been kinder to the colony than it has been to the parent, and the season is one of plenty as regards Algeria. It was none too soon. They have just had three bad seasons running, which severely taxed the credit of the colonists and was the ruin of a great many. If all the crops did not fail through either scanty rainfall, hailstorms, or invasions of locusts and other blights, the produce, chiefly wine, could not sell outside the colony. This year everyone is looking forward to a season of plenty; and carpenters, masons, coopers, and all tradespeople are hard at work preparing for the vintage, which is commencing in earnest to-morrow.

Taking the seasons as they run, although we have not, except in some of the more favourably located situations in Western Australia, such heavy returns as are shown in the plain country in Algeria or in France, yet our seasons are far more constant and less capricious, and a fair return can always be reckoned with some amount of certainty.

Some Agricultural Practices.—During a trip I made to the neighbourhood of Tocqueville, on the plateau of Setif, where corn has been grown without interruption ever since and even long before the days of the Roman occupation, I was shown large extents of country which last year carried ripe wheat crops which were estimated to go over 40 bushels to the acre, but on account of a severe hailstorm on the eve of harvest, was not even removed from the fields, and numerous flocks of goats and sheep are turned on to the ground, picking what is left of the crop.

In places the damp mist is also said to do much harm to the ripe crop of the more tender white wheats, which, when the mist lifts, is exposed to a burning sun and withers in a few hours. Some settlers, when these damp mists cover the plain, get their Arabs together early in the morning and send them over the fields in pairs, holding a long thin rope at each end and knocking off as they go along the beads of water which cover the ears. The hard wheats grown by the Kaybles and the Arabs are not scorched as are the more tender white wheats.

Except on large farms, where all the modern agricultural machinery is used by the colonists, the natives do all their cultivation and harvesting with a pair of sturdy little dun-coloured cattle, or a team consisting of a mule and a donkey and very frequently a cow and a mule yoked together, with their primitive plough, which has not been improved since the days of the Numid wars. They scratch the ground, then sow the seeds, and later on reap with a bill-hook what the elements and the numerous enemies of the crop have left standing. This is gathered into heaps, trodden by a pair of bullocks or of mules yoked together, walking round and round, then the ear chaff, the straw and the dust are separated from the heavier grain by throwing shovelfulls of the trodden mass up in the breeze. What is required for home consumption is kept and the surplus loaded up on donkeys and mules and taken to some of the weekly markets of the neighbourhood. Everyone attends these markets, and everything must fit in with them, even Sundays. When at Tocquetville I was able to visit an important phosphate mine in full working order on that day, as the two hundred odd Arabs employed on the mine have their holiday on Wednesday instead, that day being the market day of the locality.

In many respects this country looks quite Australian, but one of the most familiar features of our agricultural districts which is totally unknown here is the fences.

Algeria is very poor in timber, and the conservation as well as the replanting is entrusted to the care of an important department. The Australian blue gum is everywhere, and fine trees they are. Some years ago a malarial fever epidemic thinned out the congested population of the plains, and Australian Eucalyptus is credited with having greatly helped in restoring the people to health on these plains. The trees are omnipresent.

This country is very well stocked with flocks of the black Kabyle goat, with white stripes on the head, and mixed with the coarse Arabian sheep, in some of which is seen a dash of the Merino, are seen in every direction in the care of one or two Arab or Kabyle urchins, who have complete control over them, and experience no difficulty in keeping them off growing crops or their neighbours' unfenced stubble. Goats are a very useful adjunct to the Algerian farm stock. In Australia, where fruit trees are valued more than goats, the second are ranked with noxious vermin, and can be shot on the spot if they happen to trespass in gardens or orchards. In Algeria, where both trees and goats are equally valued, the young trees are wrapped up in thorns and branches, which, together with the shepherds, unassisted by dogs, seem quite equal to protecting them from the poisonous bite.

Another useful feature of the goat is that being more domesticated than the sheep, they make these easy to handle, and every evening one sees them heading from every direction towards the native village and through tortuous lakes and dark archways to the stone pens which are allotted to them for night quarters. This is found very necessary to protect them from the attentions of jackals, roving hyenas, and even panthers and lions, which often make themselves heard at night in the Kabyle Mountains, where I spent a few days.

I cannot help thinking that a proportion of goats to our sheep would prove very profitable to our small farmers who can handle their stock more frequently than the larger graziers. In new scrubby country more especially, they would feed on shrubs and plants seldom touched by sheep, and by destroying these, give a chance to the sweeter and more nutritious grasses to grow and thus increase the stock carrying capacity of the paddocks. The habit of the goat of coming home every evening to camp also affords here, as it would do in Australia, a valuable means of collecting a heating and valuable manure for the garden or the orchard.

Besides goats and sheep, all farm animals are stabled at night to prevent them straying over fields under crops. Those few which are left out, are securely hobbled up, and sometimes very tightly so, as is evidenced by the white rope marks on the bones of hard used donkeys and mules.

Other valuable stock, such as horses, etc., for another reason in those districts which, since the rebellion of 1871, have been wrenched from the Arabs, their former owners. These animals, especially when owned by French colonists, would be sooner or later stolen and sold in distant markets, or else hidden in some distant gorges of the Atlas Mountains until the expected reward was offered for their recovery.

One of the many Plagues of Algeria.—Even the barnyard periodically receives the visit of the marauding Arabs, and there are no settlers who do not every now and then experience a razzia amongst their poultry. The Arabs are much more troublesome amongst fowls here than are the native cats in the Australian bush or the tick in our towns and villages. So much so, that it is a great deal cheaper to buy one's requirements of poultry and eggs from them than to try to raise these commodities amongst the native population.

In fact the Arab stands out prominently in the eyes of the French colonist as one of the greatest plagues one has to deal with. What the Arabs think of their conquerors I haven't heard. Possibly, if one could gain their confidence, they would serve you, between a drink of cool spring water, as one meets with in this country, and their whole meal galotte with as many startling yarns about their present masters as one hears during the course of a killing French *dejeuner*. Nevertheless it is admitted on both sides that robbing a Christian is no sin and the Christians protect themselves by barring their windows and keeping rifles and revolvers within handy reach. It is a fact borne out by experience that the Arab cannot be thoroughly tamed, and there are examples pointed out, of highly educated natives who have gone through the military college of St. Cyr and risen to the rank of major in the army and spent half a lifetime drinking absinthe with their fellow officers and humming profane boulevard tunes, running wild again when placed on the retired list and proving the most fanatical of their tribe. The feeling of the burnous round his shoulders and his endeavours to win a comfortable corner in the paradise of the houris is sufficient at any time to upset the best balanced Arab mind.

Yet with all their faults and their shortcomings the settlers would be absolutely helpless without the Arabs and more especially the Kabyles. Labourers are paid 1s. 6d. to 2s. per day, and in consequence labour is generally wasted, and much is done by hand which in Australia is just as cheaply achieved with the aid of modern labour-saving machinery. Cheap black labour seems besides inseparable with noise, filth, and stench, three jarring notes on one's constitution, especially when the withering Sirocco is blowing and the temperature in the evening is thick and trying.

After all the dream of a white Australia has much to commend it.

6th September, 1903.

I have now been here about three weeks and have seen a lot, thanks to the British Consuls at Algiers and at Oran, who have introduced me to friends, who in turn have handed me over to their friends.

Then I have been able to gather a mass of notes bearing on the agricultural features of Algiers which, on my return, I shall draw upon for publication in our AGRICULTURAL JOURNAL.

Vintage is now running a merry pace. Last year and the two seasons before, the grapes were in the presence of gloomy forebodings. First a wholesale destruction caused by the Altisa beet and its leaf-eating grub; then also severe attacks of the mildew or *peronospora* blight coupled with unseasonable downpours during vintage and made worse by a dropping market, caused things to be anything but rosy for the vineyard proprietor.

This year things have altered and those who have been able to stem the drift of the three bad years will be able to float again on the tide of a bumper vintage, swelled by exceptionally high prices.

The vintage in France has been reduced by over two-thirds, and the French consumer must have his wine, but he wants it cheap and therefore it is served to him new. Thus there is no stock of wine in France, at least none of the type that is liberally consumed every day and sells fresh from the press from 8d. to 10d. per gallon. As regards the better class of wine the *vin de bouteille* the produce of choicer grapes grown on well exposed slopes, it is mostly sent abroad and does not enter into the everyday consumption of the country. This unexpected shortage, therefore, coming after last year's vintage which was below the average, has sent the market up sky high, and the wine merchants are busy buying wherever they can. The other evening I was dining in Algiers with four large Bordeaux merchants who had been round and already bought, at an advanced price, whole vintages still on the vines for delivery, as the wine is made during October and November. The prices I heard were 2 francs 20 cents per degree per hectolitre which, for an ordinary Algerian wine of 11° of alcohol, means 10½d. per gallon, and since then prices have further advanced, many refusing to sell in the expectancy of still further rise. The gamble is in their favour. The French crop, it is known, is very considerably reduced and no one can be certain yet that some disastrous rain won't, before the end of the Algerian vintage, come and reduce to a rotting pulp the grapes still left unpicked.

One great characteristic of these regions is the state of uncertainty of everything viticultural. It is either bad prices or bad seasons, sometimes both together.

Since I have been at Oran several steamers have already left for France with new wine made a week or two ago. The casks are set in the hold of the steamers, bung up, and each bung has a quill or vent hole in it to enable the carbonic acid still in the young stuff to escape. These wines will be handled at Cette, at Marseilles, and at Bordeaux, and within three months will be readily retailed and consumed without a protest.

One would think that Algeria being a dry hot country would produce very alcoholic and strong wines. This is not the case or at least not entirely so.

The country produces three main classes of wines:—

(1.) Common wines, poor in colour with no characteristic taste and going 10° to 11° of alcoholic strength.

(2.) Blending wines, thick and heavy, dark and spirituous showing $10\frac{1}{2}°$ to 14° of alcohol and even as high as 16°.

(3.) Good drinking wines which more closely approach our Australian wines and have 11° to 13° of alcohol, and are possessed of good keeping qualities and character.

Of the first class the country produces about 50 per cent. of its total yield.

When seasons are good in France this wine sells badly and much of it goes to the still house. It is the wine which gluts the market when seasons are fair.

The second class is readily snapped up by Continental buyers for adding body and character to thin French wines. It represents about 30 per cent. of the total yield.

The third class, which consists of about 20 per cent. of the country's vintage, is every year bought by the Bordeaux merchants and are also sent to Germany, Holland, and Belgium. This type of wine is easier to produce in Australia than it is in Algeria.

Which is the most profitable wine to produce? This is a doubtful question concerning which even the local powers are not unanimous.

Vineyards are here in many cases planted on rich alluvial flats, and the vines grown, unlike ours, which belong to the choicest Medoc and Hermitage varieties, are of less pronounced merit. The grapes mostly grown are the Petit-Bouschet and the Alicante-Bouschet which produce heavy crops of grapes with a thin and highly-coloured juice, and also somewhat better varieties, such as the Carignan, the Mourvèdre (Mataro), Grenache, and Morastel, which latter is one of our favourite grapes in Western Australia. For white wine the Clairette is the most extensively grown, and next to it the Ugni-Blanc (Trebbians) and the true Algerian grapes of little merit, the Aïn-Kelb and the Farana, grown for quantity more than quality.

On these rich plains the vines, which are besides manured by the more enterprising proprietors, yield enormous crops, averaging 80-100 hectolitres per hectare, or 700-900 gallons per acre, and in places where the vines are irrigated, even heavier crops. On the slopes and on the higher plateaux, the yield may be halved, but the quality is generally superior and prices better.

Some of the vineyards are of considerable size and measure 200-500 hectares in one block, or 500-1,250 acres, and to handle these enormous crops some enormous wineries have been put up, which deal with the vintage within about four weeks. The enormous yield of the vines on the flats and the ready sale of the new wine within a few weeks of vintage enables the Algerian vineyard proprietor to build and equip gigantic cellars. The problem he has to face is this: given the uncertainty of the weather towards the latter part of the vintage season, the readiness with which the varieties he favours do rot and spoil and the difficulty of picking and hauling a heavy crop, is it not to his advantage to equip his cellar even at an enormous cost so as to gather in the grapes as quickly as possible? Past experience has answered the question in the affirmative.

Of the methods used and how far they would meet our requirements, I shall not venture in these notes, leaving the consideration of a number of interesting questions relating to them to some future occasion when I can settle down and analyse them with some detail.

From what I have said it must not be inferred that all vineyards are planted here on flat land, although the most important and those yielding the thin, washy stuff which enters into immediate and wholesale consumption are. The bulk of the labour being performed by hand and done by Kabyles and Arabs at 1s. 10d. per day, some most inaccessible slopes are found under vines, but as a rule these vineyards are not very profitable.

Fruit-growing, born in Algeria of late years, has already grown to important dimensions. It owes its present development, in a great measure, to the force of circumstances. For many years a good deal of the fruit and vegetable requirements of Algeria, apart from dates, figs, and prickly pears, which are typical fruits of the country, were brought over from Spain in hispanic falancas. Then all at once free-trade was put an end to, and the interchange of all goods between Spain and France became controlled by the provision of an interstate tariff. As a result garden produce went up to famine prices, and there was locally a great outcry at the state of things. Whilst some paused and abused the Government, others looked around, and it was soon discovered that water could be obtained in great abundance in Algeria for sinking a few yards below the surface. Wells and norias water-wheels soon dotted the country, and, with easy means of irrigation placed within reach of everyone, a large trade of early garden produce and in fruit sprang up in Algeria, which at present supplies in that direction, to a great extent, the requirements of France.

In respect to its water supply, like in many others, Algeria has some points in common with Australia. Like Australia, its coast line shows a fringe of mountains, beyond which the country is flat and in many places sinks into depressions which at times become salt lakes. The water which runs from the slope of the Atlas ranges towards the sea forms in the rainy season torrents, which feed larger torrents, which go dry in the summer. A few small rivers are found, but they are very unimportant. The water is not all lost in the sea, and a good deal sinks into the ground and comes out again from rocky slopes as cool clear springs, or goes to feed the great underground water table which is tapped on the plains and lower plateaux at depths of from 3 to 30 yards. In places this water is heavily mineralised, and in many wells chlorides are easily detected, as is the case in Western Australia. On the whole, however, the water from these wells is more palatable than is well water with us; and the amount of salt, so far as the very cursory examination I have been able to make in some of the most fertile districts of this country goes, is less than with us. This might be due to their more abundant and more gradual dilutions from the source of the melted snow which, until the spring, caps many of the peaks of the Atlas Mountains.

Of orchard fruit, Algeria cannot boast of the same variety that Australia does. Cherries are almost unknown, and so are apricots, the spring being too frosty for these fruits. On the well-sheltered, high plateaux of Medea and of Tlemcen, however, these fruits do fairly well; but such favourable localities are few and far between in Algeria. Of plums, I have tasted a few which were fair; apples and pears are only grown in a few districts on the higher plateaux, and I have not tasted, neither have I seen displayed in markets anywhere, anything superior to our own average culls.

Besides, the codlin moth is quite as bad here as it is in South Australia or in Victoria, and a large proportion of these fruits placed on the table are wormy; but no one complains. As regards the codlin moth, Algeria is, like Australia, the victim of its introductions; but no measures are being taken here either to repress it or to exterminate it.

Of the fruits grown in Australia, the fig and the citrous fruits alone are cultivated on a large scale. The figs are excellent, and some Adam figs and White Adriatic, as well as other native sorts I tasted in the Kabyle Mountains, were as good as any grown in Western Australia. Either fresh from the tree or dry the fig enters largely into the diet of the natives, and there is some talk of establishing in Kabyle mills where figs would be torrified and turned to a meal, for which there is apparently a demand as an adulterant or substitute for coffee.

I am trying to procure from reliable sources a few cuttings of some of the best Kabyle sorts, properly named.

The best orchard fruit produced in Algeria is unquestionably the mandarine. They own that Spain has better oranges, but they are emphatic regarding the quality of their mandarines. As the season is not on now I have not been able to judge for myself, but certainly if the quality of the fruit does not belie the productiveness of the tree and the appearance of the crop even at this early period, they ought to be hard to beat. One mandarine and orange grove I visited at Boufarik, and owned by an Englishman, Mr. J. R. Cox, covers 50 hectares or 125 acres. Like several others I have seen, it is planted on flat, rich plain-soil, and is kept well irrigated and manured. The trees are planted very close—18 feet apart—and are trained European-fashion, on high stems. Under the circumstances horse cultivation is almost out of the question, but with cheap Arab, Kabyle, or Moroccan labour readily available this is no great disadvantage, certainly not so much as the spread of pests, and notably the scurfy scale (*Chionaspis*), which in some orchards encrusts the leaves or the fruit. With the branches of the trees entwining, these scale insects spread readily, and so bad are they around Blidah that some groves which I was told yielded enormous crops a few years ago are now almost abandoned.

Against this and other scales the French colonists apply the one panacea, viz., Bordeaux mixture, but they use it in a more dilute form than on the vines. They say that sprayed trees assume a greener and a healthier look than unsprayed ones. Luckily, we are not pestered with that scale in Western Australia, although we are at any season threatened with their introduction by the large consignments of oranges from Sicily.

As sweeping winds blow hard during the time the citrus fruits ripen and knock a great number down, the plantations are subdivided into squares and protected by means of thick walls of cypress. After a number of years, when these grow too close, many a good straight pole is obtained from these windbreaks. The cypress robs less than most other trees used for shelter and, moreover, it yields readily to all kinds of lopping and cutting back, and can be planted quite close together—generally one metre apart.

The planter does not as a rule market his own fruit. This is done by packers, who buy whole crops. Some planters who own good orange groves, and are known to look after these well, have sold their crops two years ahead. Most of the mandarines and oranges in the province of Algiers, even when superior to those grown near Blidah, are taken there, whence they issue forth again in packages duly branded as Blidah fruit.

Fruit-growers over here are not unfamiliar with the Fruit Fly, which threatens to do so much damage. Mr. Ch. Riviere, the Director of the Jardin d'Essai, near Algiers, who is a reliable authority, assured me that he noticed it as far back as 1874. Several prominent growers have also told me that it is very troublesome every now and again. Whilst strolling amongst the mandarine and fig trees at the extensive fruit farm and nurseries at Messerghin, near Oran, I myself saw a number of the flies on these trees. Nothing is done to check it. Some wormy figs I saw on the ground, around which ants were busily engaged, but a good many I picked up and opened had no grubs in them, and although I have reason to believe the fruit placed on the table are not pricked, I have not yet struck a wormy one. Is there a parasite which keeps the fly in check, or not? I am not able, at the rate I am travelling, to ascertain; but the gardens at Messerghin offer, to my mind, the fields of observation I have met with.

To-morrow I am crossing over to Almeria, and although I could considerably add to these notes, written in a hurry, I will defer doing so till my return, and shall in a couple of weeks or so post you some further notes from Spain or Portugal.

8th September, 1903.

SHIPMENT OF GRAPES FROM ALMERIA.

A chance steamer, a foul-smelling and dirty little Spanish tub, took me from Oran to Almeria, a distance of barely 70 miles, in 13 hours. Speedier boats go to Malaga or Carthegena; but as I was anxious to see something of the great grape-exporting port of Spain, I came straight here. I landed on the 10th of September, too early to see the better class of grapes picked, but in good time to see them at their best, hanging on the vines.

Many kinds of grapes are grown in the valleys around Almeria, but only one deserves recognition as a first-class export grape, viz., the *Casta de Ohanes*, known in trade language as the *Almeria*, a name it owes to its principal port of shipment. To Mr. William May-Lindsay, the British Consul at Almeria, we owe its introduction to South Australia and then to Western Australia. This valuable variety, Mr. Lindsay told me, was first noticed at Ragol, a small village adjoining Ohanes, where it is cultivated in a fertile little valley, called La Daira. At Ohanes the grape improved both in flavour and in keeping quality, and many bunches are kept until Christmas; indeed, it is said that some have been kept for the best part of a year.

From Ragol and Ohanes its cultivation has spread to all the villages along the valley of the Andarax, down even to the town of Almeria. From October till the middle of November large shipments of this grape are sent away to England and to the United States. They are packed in small oak or pine barrels, carefully filled up with granulated cork dust. This cork dust comes from Catalonia and Gibraltar. Each barrel holds about 46lb. to 50lbs. of grapes. Great heaps of them are seen at every station along the line. The packing is done at the villages; the consignments are then sent to Almeria, where the representatives of exporting firms, who come over annually purposely to effect purchases, buy whatever they want, and export them to their destination.

The Ohanes vines around Almeria are all trained on the overhead trellises, about six or seven feet high, each vine having one simple, straight stem with a top, spreading canopy-fashion over a network of wires, stretched at intervals of 20 inches or so. The sides of the vineyards are also frequently wired up in the same fashion, so that the whole structure resembles a huge aviary. This is intended more as a barrier against marauders than against birds, which also abound here.

The crop at present looks very well. Huge loose bunches hang from the overhead trellis, well sheltered by the foliage above from the scorching sun, and free from mud splashes and dust. The height of the trellises permits of cultivation with mules or donkeys, whilst irrigation is also carefully practised. The climate around Almeria is so arid that the cultivation of these grapes would be quite unprofitable were it not for artificial irrigation, which is applied wherever water can be led on to a patch naturally flat or carefully graded by hand labour.

Several other grapes I also saw at Almeria, and notably one which I found growing in its natural home in Algeria, where the Moors knew it under the name of *El Boidj*. The same grape I find here under the name of *Molinera* and also *Colorada*, whilst at Xeres I saw it growing under the name of *Corazon de Cabrito* (Heart of the Kid). I was particularly interested in this grape, which a few years ago I introduced into Western Australia from California, where it is called "Flame Tokay," a most unsuitable and highly fantastic name, given probably by some enterprising propagator of that handsome grape. Like the Ohanes, the *El Boidj* is fleshy and lacking in flavour, but it is not such a good keeper and is somewhat subject to the attacks of the Oidium fungus, but its gorgeous colour and appearance make up, to some extent, for these shortcomings.

GRENADA, THE FERTILE VEGA, AND A BOLSTERED-UP INDUSTRY.

British Industry in the Iberic Peninsula.

From Almeria the railway goes up a pretty steep incline, following deep ravines carved by mountain torrents between the barren Sierras on each side. Wherever irrigation is possible there are little green oases overcrowded on the lower level with orange groves and vineyards and fig and almond plantations; then higher up with cherries, olives, and lucerne, maize, and potatoes. On the higher plateaux extensive plains stretch out, which are cropped once a year and support a number of the evergreen oak tree, which I found all through the Kabyle Mountains, and which yield heavy crops of sweet acorns which, during the autumn months, fall on the parched soil and fatten large herds of pigs.

On getting closer to Grenada the country changes, and the vega or extensive alluvial flats which stretch in every direction for miles around gives one an idea of the variety of the crops grown and of the fertility of the soil. On a large scale, these plains put one in mind of the Dongara and of the Greenough Flats, the sand downs and hillocks which encompass the latter being represented by the Sierra Nevada and other chains of lofty mountains.

Wheat, lucerne, maize, potatoes, and sugar-beet are the chief crops grown. Along the railway line, which runs through the vega, I counted sixteen or eighteen sugar factories, and I am told that of these there are a couple of dozen round which huge stacks of beetroots are taken at this time of the year in railway trucks, mule and oxen carts, or by strings of the ubiquitous pack donkey.

I had no opportunity of visiting any of these sugar factories, but an old resident at Malaga, who knows several of them, told me that they are far from being worked on up-to-date lines and that their methods of working were antiquated and wasteful; in fact the companies owning these central mills are quite content with the small profits they make, and so long as the protective duty of 4d. a lb. against foreign sugar is maintained they are not likely to introduce the required reforms in their method of manufacturing the article.

A few hours after one leaves the high plateaux of Grenada, where sugar beet is extensively cultivated, one meets, lower down, a few moribund sugar plantations. This year, owing to spring frost, the crop is greatly reduced, but this is a fact that does not concern the planters overmuch, as they estimate that one good crop every third year pays all their expenses. Were it not for the protective duty of £36 per ton on sugar, these fields would long ago have been devoted to some other culture; but with the sugar industry bolstered up as it is at present, labour obtainable at 10d. per day, and a most lamentable lack of technical education, Spain will never rank as a sugar-producing country.

After visiting Almeria, Malaga, Xeres, and Oporto, one fact strikes one forcibly, and that is the thriving and prosperous condition of those industries to a great extent controlled by British energy, capital, and brain, as compared with those slumbering under the management of the natives themselves.

At Almeria the prosperity of the port is to a great extent due to the commerce in shipping grapes with Great Britain and in the influence of British capital and management in directing the operations of the iron mines located in the Sierra inland.

On the way from Grenada to Malaga one's attention is at once directed to the extensive estate presented by the Spanish Government to the Duke of Wellington at the close of the Peninsular War. For several miles the railway runs through that property, on which is seen a fine olive plantation, laid out, unlike most other olive groves in this country, in lines stretching in every direction with mathematical precision. Several thrifty villages are scattered over that estate, which supports a large population engaged in growing crops and in stock raising. At Malaga, at Xeres, San Lucar, and at Oporto, in Portugal, the leading wine firms are controlled by British capital and brains, and whilst others come and sink, some of these firms have transacted business for close on to a century or over.

The Wines of Spain and of Portugal.

About these I will merely content myself with a brief mention, as it is my intention after my return to dive into my bulky notes and describe with some detail the grapes grown in Spain and Portugal; the natural conditions of the soil and climate which influence their growth; and the methods of wine-making and of its subsequent rearing at the bodegas and lodges.

Wherever I have been to, besides being given an opportunity of tasting wines drawn from some of the patriarchs stored amongst the stacks of casks at the cellars, I have sampled a number of wines taken from the rank and file that every day find their way into the market. For producing that class of wine Australia, and Western Australia more especially, is to my mind well adapted. Of course, when we begin to make wines of the sherry type on a large scale, it would be impracticable to copy faithfully the methods of rearing from soleras—or mother casks—which obtain at Xeres or at San

Lucar, but we could nevertheless turn out a good class wine of the same type without, for that matter, going through the same lengthy process.

The methods of making good wines of the mulago, sherry, and port types are precisely the same at the present date as they were at the time of the Peninsular war. The average Spaniard or Portugese is too ignorant and too fastly wedded to old practices to venture out of the rut of routine, and whilst some casks or some vintages turn out nectar fit for the gods, others are simply heavy, drowsy wines, without distinction or special merit.

Whenever innovations have been introduced they have proved the bane of the Peninsular wine industry, and busy centres of adulteration now exist in these countries, as well as at Cette in the South of France, and in Germany, whence imitation wines issue bearing on their labels the fair names of the great wines of Spain and Portugal. In fact the leading firms in Malaga and other centres complain that that modern evolution of the chemical laboratory, the German imitator, has for some time past started operations, and with the aid of molasses, fig syrup, and beet and potato spirits, turns out cheap and nasty concoctions, which unfairly sell as Malaga and other such wines.

Of ordinary table wines, Spain produces several sorts, and most of those I have tasted would be pronounced vile and undrinkable in Australia. Two amongst these proved exceptions, viz., the "Rioja" wine (from Rioha), grown on the River Ebra, in Navarra, from Medoc vines, and made according to methods practised around Bordeaux. These wines are the nearest approach to good Australian red wines that I have tasted in Spain, and they command a good sale at all good hotels and railway refreshment rooms or "fonda." The second are the "Valdepeñas" (pronounced Val de Pegnias), which, however, is not so uniform as regards quality as is Rioja. The cheap nasty wines found on the table at hotels and restaurants is generally said to be Valdepeñas, but some bottled wine I tasted was much better, although it was nothing very special.

Raisins Drying,

As an industry, attains even larger proportions in and around Malaga than the manufacture of the well-known sweet wine. Whereas Pedioximenes is the favourite grape used in the manufacture of the sweet wines, the muscatel is the grape grown for drying into raisins. The vineyards are established on rich diluvium, made up of the wash from the up-country Sierras, and consisting of a dun-coloured loam, mixed with a quantity of water-worn stones. The vines are trained low and spur pruned, never more than two eyes being left to each spur. So low is the crown of the vines that small holes have to be scooped out of the earth underneath a great many of the bunches. When they are quite ripe the grapes are carefully picked, placed on flat bamboo baskets, which the pickers carry on their heads to the drying terraces. These face the south or south-east, and have a slope of 30 to 35 degrees. They are 20 to 30 feet long, and 12 to 15 feet wide. A wall encompasses them, the cavity being filled with earth and the top faced with clean gravel, over which the bunches of muscatels are laid. The refracted heat from the pebbles obviates the necessity of turning the bundles, which dry as readily underneath as above. At night a wide piece of canvas or awning is drawn over each terrace, and is carried over a central ridge-beam three feet or so above ground, and running along the central axis of each bed; from this ridge the canvas slopes down towards the sides of the beds, when it is made taught by means of strings. Late in the afternoon or early in the morning the drying yard thus looks like a military encampment, with long rectangular tents, evenly pitched side by side. When the raisins are almost dry they are kept covered up under the awning night and day, and when ready sorters go over the beds, kneeling over boards resting on the side walls.

Beginning at one end of the bed they gradually sort the raisins into grades and place them on trays, which are carried away into the house and placed wherever there is a spare corner. After a week or two the packers sort them out, clip off defective berries, and pack them into specially-made boxes. The whole operation of airing is conducted in an atmosphere of dust and smoke, and necessitates a display of more manual labour than is customary in Australia. Our Californian wooden trays I also consider an improvement on the drying terraces, and when we understand the necessity of careful grading and packing better than we do at present, the Australian raisins will in every respect compare with the Malaga article.

Spanish Fruit.

During my travels through Spain I took every available opportunity of visiting fruit orchards, markets, and shops.

Soft fruit are not cultivated to any extent there, as they are almost invariably attacked by the fruit fly.

Apples and pears are, on the whole, free from the codlin moth, although no attempt whatever is made either to poison or trap the pest. I have come across a few wormy fruit, but merely sufficient to indicate that the codlin moth is in Spain, but does not prove a pest here. In Algeria it is quite different, and although apples and pears can only be successfully grown in a few of the cooler mountain plateaux of the Atlas, yet the codlin moth rages there and seems as bad as it is in some parts of Australia. Now the conditions under which the pest has gained a footing in Algeria are so much like those which surround its introduction into Australia that the contention of our Entomologist, Mr. Compere, that the pest is held in check in Europe by some natural parasites not as yet known in Australia, has much to commend it to the mind of those interested in the cultivation of both the apple and pear.

The orange groves all through Spain and especially around Seville, I found sorely affected by the red scale and also in some places by the *dactylopius* insect, better known as the "mealy bug." One kind of ochre-coloured ladybird, somewhat similar in appearance to the *cryptolœmus* ladybird we introduced from Queensland, I found preying on these insects. Besides what Nature itself has provided for checking these pests, nothing is attempted by the Spaniards to keep their orchards clean.

Noxious Weeds.

These too abound in Spain, and two troublesome weeds well known to Australian landowners I noticed at several places, viz., the Stinkwort and the Bathurst Burr. Nothing is done to check their progress, and some cultivated fields and also some ditches were well stocked with them.

In addition to these they also have several sorts of thistle, not to mention various weeds I am not familiar with.

The Evergreen Oak and the Cork Oak.

Among the most useful trees in Spain, in Portugal, as well as in parts of Algeria are the cork oak and the evergreen oak. These find in those countries their natural habitat, and are a source of constant and large revenue to the landowners.

For a long time the Spanish charcoal burners cut down the cork oak tree, until he woke up to the fact that they yield periodically a valuable return in the shape of slabs of cork. These trees grow on granite country and do not seem to care for soils rich in either lime or phosphates. They should thrive exceedingly well in some of those extensive tracts of country in Western Australia, which so closely resembles the hills they naturally grow upon.

Even more valuable than the cork oak is the evergreen oak, which produces annually large crops of sweet acorns, which afford for the swine a most valuable article of food.

These trees grow everywhere in Spain, from the barren Sierras to the rich and fertile vegas, where, of course, they attain large dimensions. It is the custom all over Spain to hold autumn fairs at every centre of any note where herds, counting hundreds of store pigs, change hands and are brought up by those who have evergreen oaks on their land. These trees do not grow thickly, and wherever the nature of the land permit, cereal crops are sown amongst the trees, after the acorn crop has been duly picked up by the swine.

For miles upon miles the railways run through country which only carries the evergreen oak, where in the winter months a crop of corn is also taken.

So much do I think of this tree, that I have arranged for a small bag of the acorns to be sent addressed to me on board the boat when I leave Marseilles. These we will grow at our experimental stations, for the purpose of demonstrating to our farmers their value for feeding purposes.

The Spanish Cattle.—Foremost amongst the cattle I saw in Spain or in Portugal.

I will place the red swine of the Peninsula. Its colour is that of the Tamworth, whilst its shape is somewhat that of the Large Black. It is adorned with flopping ears and with curious appendices of the shape of small goat's teats under the jowls. Its head is not so coarse as the Tamworth's, but it is a good forager. At 15 months these pigs are quite big and they readily fatten. They are prolific, hardy, and docile. They thrive in a country in many respects much like Australia, and altogether they are a breed evolved from the natural environments which surround them and not any artificial creation, like most English breeds. At this time of the year when the acorns are hanging almost ripe on the trees, one sees numerous herds of these pigs on the slopes of Estramadura, where for the next couple of months or so they will have no other food, and will then be driven to the farms to be topped on maize and sold as fats. I should like to see some of our enterprising farmers pay some attention to these pigs, which in many respects seem so well adapted to the conditions which prevail in Australia. Although I have not been able to secure good photographs of these animals, I have been promised some which I hope to receive before I leave.

Of the other farm stock I will say little. The ubiquitous donkey is perhaps the most valuable animal in Spain, where bridle tracks are more numerous than carriage highways. There is only one breed of these animals which to my mind excels this, and that is the large Poihore donkey. Whether he is as hardy an animal or rather the result of more careful breeding in better pastures, I am not prepared to say.

Of Andalusian horses, I was afforded an opportunity of seeing some of the best bred in the South of Spain, where I visited one of the most noted studs. They are fine up-standing dark bay animals, with black main, black points, and a long wavey tail. They carry their head high on a neck with a fine crest, and have splendid shoulders, but are not so well built behind. Their action, however, is too high, and they have a very ugly way of moving, and dish out to excess. This action has been cultivated almost to a fault by the Spaniards, who so dearly love all outward show at any cost.

Of the cattle, two breeds alone are kept, the dun draft breed, and the dark, wild animals, the *Teros bravos*, which supply the material for the barbarous and cowardly national sport, which is a kind of revival of the gory wild beasts exhibitions of the decadent Romans.

LECTURES ON BACTERIA

(continued).

The Adelaide University Extension Course.

By Dr. E. Paget Thurstan, B.A., M.D. Cantab.

LECTURE II.

Bacteria as Friends.

In my previous lecture, ladies and gentlemen, I showed you how modern bacteriologists had evolved from the microscopists, beginning with Anthony von Leeuenhoek; how, step by step, the great puzzles which our predecessors had been unable to solve had been mastered until now we are able to isolate and examine at our leisure the minutest germs. I hope I enabled you to realise how universally distributed bacteria are, in the air all round us, the water, the soil, in and on ourselves, and our domestic animals. I

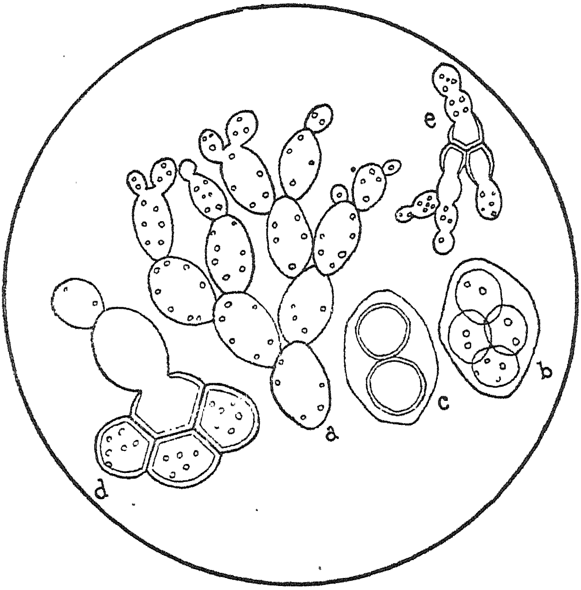

Fig. I.—*Saccharomyces cerevisiæ*, or yeast of beer (highly magnified).

also endeavoured to show you how incredibly numerous they are. It is said that no one can truly realise any amount over a hundred thousand, though I suppose millionaires are exempt from this weakness. But even millions totally fail to convey any idea of the numbers of bacteria within easy reach of any one of us. They are far more countless than the sands of the sea-shore. It is plain

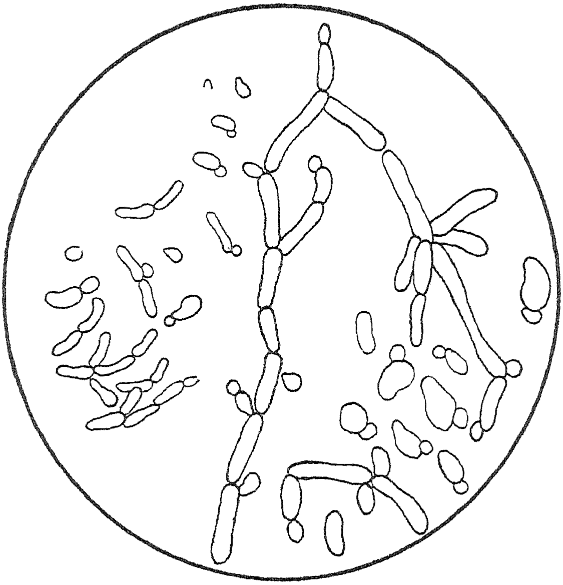

Fig. II.—*Saccharomyces pastorianus*, ferment of secondary fermentation of wine (highly magnified).

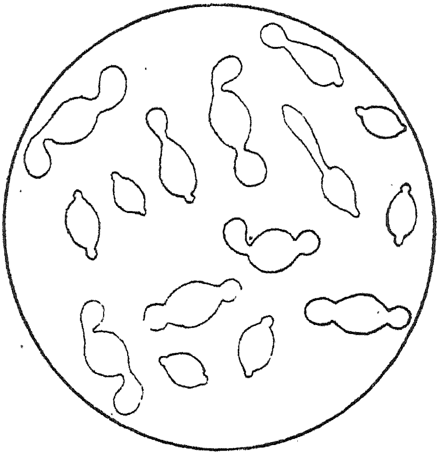

Fig. III.—*Carpozyma apiculatum*, yeast of unripe fruit (highly magnified).

that they cannot possibly all be injurious, or how come we to be alive at all? As a fact, only a small percentage of micro-organisms are injurious. Instead of its being a wonder that we manage to live in the midst of such a cloud, the real fact is that we could not manage to exist at all without them. An eminent Frenchman, M. Duclaux, has brilliantly said of germs: "They protect the living against the dead. They do more, if there are still living beings. If since the hundreds of centuries the world has been inhabited, life continues, it is to them we owe it." A German scientist, Cohn, has expressed almost the same idea. He asserted

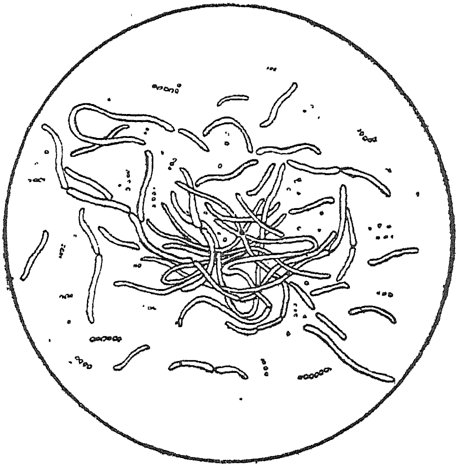

Fig. IV.—Bitterness Ferment.

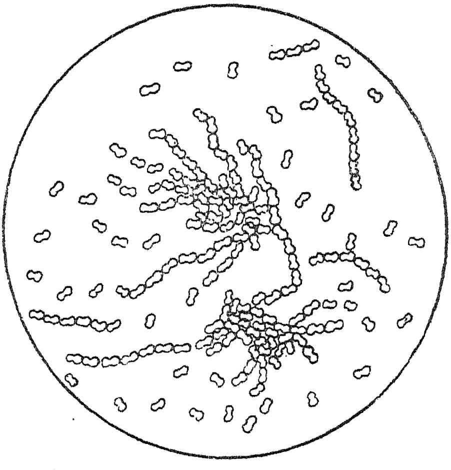

Fig. V.—*Mycoderma* or *Diplococcus aceti*, $\frac{700}{1}$

that, "Supposing that by the fiat of an Omnipotent Being all microbes could be annihilated, the earth's surface would soon be covered by dead bodies, remaining unchanged year after year, century after century. All the carbon which all living beings use in turn would soon be tied up. There would be no food for green plants; herbivorous creatures would cease to exist. The contemplation of these imaginable horrors gives us some notion of the part played by microbes in the order of Nature."

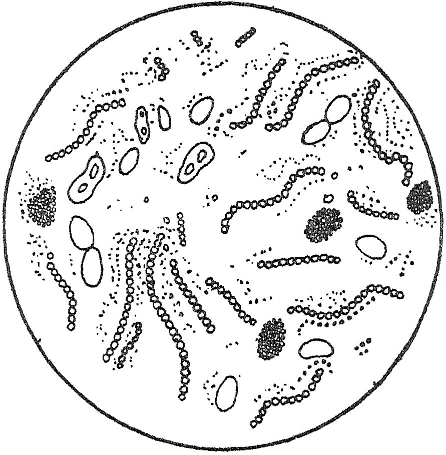

Fig. VI.—Grease or Ropy Ferment of Wine, $\frac{700}{1}$

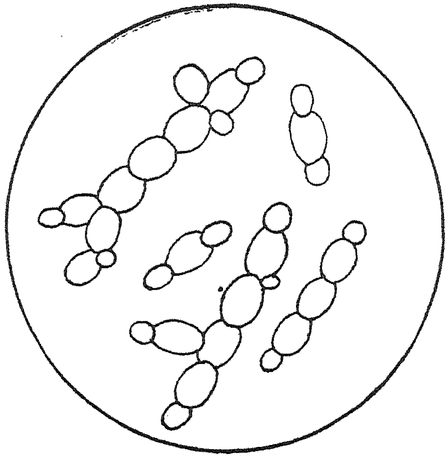

Fig. VII.—*Saccharomyces ellipsoideus*, yeast of wine (highly magnified).

This lecture deals specially with the germs whose beneficial action enables us to carry on sundry trades absolutely essential to our existence. People are apt to argue—so long as we know how to carry on the trades, "Why should we trouble our brains with all these 'ologies and their jaw-breaking Greek names?" I hope to convince you to the contrary to-night. If an ounce of practice is worth a ton of theory, I can, and will, show you by-and-by the example of a small country which is making millions per annum by acquiring an ounce of practice concentrated from the ton of theory obtained by the scientists in their laboratories. I say fearlessly that every farmer, every vigneron, every baker, brewer,

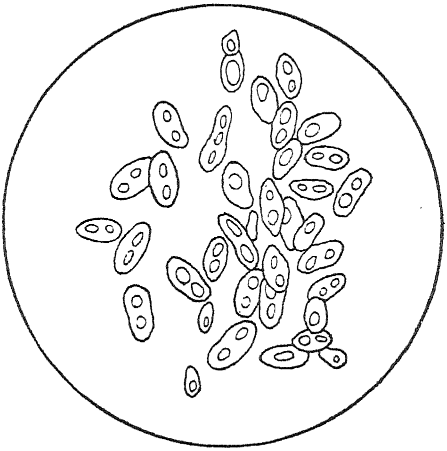

Fig. VIII.—Flowers of Wine, $\frac{700}{}$

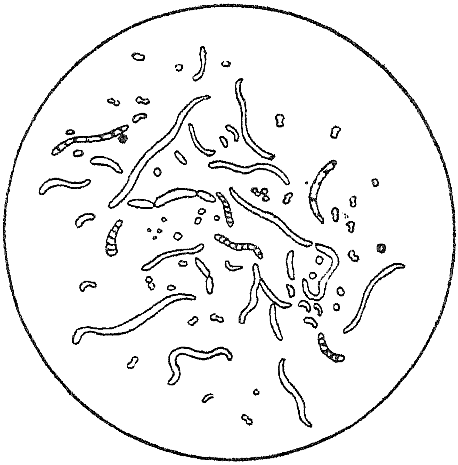

Fig. IX.—The Pousse Ferment, $\frac{1000}{1}$

tanner, butter factory hand, dairymaid, flax-grower, tobacco manufacturer, and hospital nurse will do their daily routine work better after having learned something about the scientific ultimate causes of the processes going on around them. I do not mean that they should acquire microscopes and culture chambers, etc., but that they should give sufficient time to study to know something of bacterial life and processes. There are actually museums established solely for preserving specimens for comparison, and for maintaining pure cultures of hundreds of varieties of different microbes. Let me tell you that Mr. Le Soëuf, at the Zoo, has a light task in feeding his numerous dependants compared with the skill and labour necessary for catering for these germs, who are as capricious in their likes and dislikes as any invalid. They insist on having fires in their bedrooms, and are most particular as to presence or absence of fresh air. There is an old story of two ladies in a steamer, one of whom annoyed her fellow-passengers by continually calling out, "Steward, open the door, or I shall die"; while the other inflicted equal torture by groaning, "Steward, shut that door, or it will be the death of me"; until an irate old gentleman exclaimed: "Steward, open the door and kill one of those ladies; then shut the door and kill the other." Whether the steward fulfilled this inhuman order history does not relate, but certain it is that an anaërobic germ refuses to flourish where there is air, while aërobic germs cannot exist without it; so the "stewards" have to be careful, or they may open the door and kill one germ, and then shut the door and kill the other.

The first process I shall deal with is fermentation. This is produced by the action of the yeast-germ, which I will now show you. This is everywhere in the air. In the days of "rule of thumb" it was from this source that the original inoculation was obtained; but there are better ways. The air contains many other microbes besides those of fermentation (Fig. X.). If you expose a slice of potato to the atmosphere or a plate of nutrient gelatine, and then set them to incubate in a culture chamber, you will find that the number and nature of the germs that develope will constantly vary. On the screen we will now show the various forms of different micro-organisms which were shown last lecture. The number of germs in the open air rises to 5,000 per cubic yard. In hospitals,

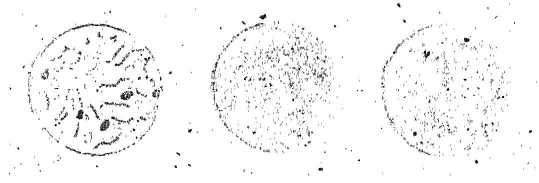

Fig. X.—Hostile germs that hinder wine-making.

barracks, schoolrooms, and public assembly rooms this number may be greatly exceeded. Far out in the ocean there are no germs, and as we ascend mountains they become fewer, until at ten or twelve thousand feet they cease. I myself camped once at 9,000 feet above the sea. At 2,000 feet up I rode through vineyards, and bought a quantity of grapes. These got a good deal bruised, and would not have kept a day at the sea level, but at my elevated camp the only reason they did not keep for ever was that I eat them all in the course of three or four days.

You can see that it is a clumsy method to employ the germs in the air for the purpose of starting *any* process, owing to the variety of other sorts necessarily present. Nowadays scientists isolate the various germs in the manner I described in my last lecture, as having been devised by Koch. You will see by the time we have finished that attenuation, separation, and keeping up a pure culture of the required micro-organism is practically the method adopted in every trade with the most pronounced success.

In fermentation these yeast-germs change sugar into alcohol and carbonic acid gas and water—the gas is given off, and the alcohol and the water remain. When the spirit gets to a certain strength it brings the work of the germ to an end. If you want to get a strong alcoholic strength you have to adopt another process—distillation. Yeast-plants seem to have no less than five different sorts of ferments: one (viz., diastase) changes starch into maltose; a second (glucase) converts maltose to glucose; a third (rymase) changes glucose into alcohol; a fourth (called invertase) alters cane sugar into invert sugar; while by a fifth (proteolase) albuminoids are acted on. Moulds and other microbes possess these ferments as well as yeast plants. Some Continental brewers are actually using these. The bacillus *coli communis* (the common intestinal bacillus) is an alcohol-maker, so that the most a teetotaler can claim is that he has never *tasted* alcohol; he cannot be sure he has never had it in his system.

The sugar on which the yeast-plant works, is furnished by fruits or grain. For instance, the sugar of apples ferments into cider; of pears, into perry. If, as in the delightful little story told by "Points," a guest has honey for breakfast, and remarks to his host, "I see you keep a bee," perhaps he does not know that he might have been offered mead instead of honey if his host had "kept a yeast-plant" as well. All the world over the secret of fermentation is known, though not always the existence of the the yeast-plant. Rice and palm-juice are used in tropic climes, and grape-juice in temperate ones. When I said that sugar was furnished by grains I was not strictly accurate, inasmuch as what is really contained within the husk of barley (the usual grain used in beer and whisky-making) is starch, not sugar. Starch will not dissolve in water, while sugar will. Hence nature seems to have stored her material in the form of starch for keeping purposes. As soon, however, as germination begins—that is, that the life-possessing speck contained in the grain of barley begins to be active—the starch is quickly changed into sugar. Being thus made soluble, it is taken up by the new seedling and elaborated by it into rootlets which thrust downwards into the soil, and a blade or leaflet which shoots upward. Thus, the sugar made from the original starch is intended by nature to form a store of food for the young plant until it is able to produce organs capable of assimilating nourishment for itself, just as the contents of the egg are intended as the first food supply of the embryo chick, though too frequently cunning man comes along and appropriates the store to his own use. The process of changing starch into sugar, preparatory to converting that into alcohol, is known as *malting*. Sufficient warmth and moisture is applied to start germination. As soon as the change of the starch is complete, a degree of heat is applied which is sufficient to destroy the life of the seedling. Having slain the babe, we steal the food its mother left it as a legacy. Thus, sugar is worked up into beer by the brewer, or distiller into whisky, with or without the consent of the revenue officers, as the case may be. In wine-making the sugar is already there in the grape-juice, and needs no previous malting. It has always been the case that some nations, and some men in every nation, made better wines than others; but why this was was unknown till Pasteur's time. Sometimes the wine became very acid—the public called this vinegar, the chemist acetic acid. Sometimes the wine became unpleasant, or even positively offensive, and had to be thrown away; or worse still, was doctored up until the horrid taste was partially disguised, and prevented from further decomposition by the addition of bad raw spirit, and foisted on a long-suffering public. The making of crude spirit for doctoring inferior wines is a very large trade in itself. The stills are so constructed that only alcohol and no other produce of the original material distils over. Thus, no matter what the raw material is, the resultant is the same—naturally the cheapest material is used. This is usually diseased and rotten potatoes. By a grim irony they call this alcohol "silent" spirit, because it tells no tales! Now, I want you to mark where the precision of modern science comes in. Pasteur found that the germ which changed grape-juice into wine was a specially modified form of the yeast-plant. As I told you before, so long as this microbe is taken from the air others enter with it. Two specially concern wine-makers. One produced acetic acid, and thus changed the alcohol into vinegar; the other (or others), which produced decomposition, did best at higher temperatures than the wine-yeast could stand. The rate at which germs multiply is the measure of their vigour. Thus, the temperature at which germination is conducted is the essence of the process. In Northern Europe, where the weather is generally getting cold by the time the vintage is over, they frequently have to warm the must. In Australia there are often temperatures between 95deg. and 100deg. in the fermenting chamber, so it is frequently necessary to devise means of *cooling* the must. In small vineyards this can be accomplished by picking grapes only at the coolest hours—the early mornings and evenings. In other cases, where water is plentiful, coils of water-pipes are laid in the vats (Fig. XI.). Where water is too precious they sometimes draw off part of the fermenting liquor and put in fresh grape-juice to bring down the temperature, or draw off a pailful of cooler must from the bottom of the vat and pour it in at the top. Thus, bacteriology first taught wine-makers the importance of keeping up a fixed temperature. But it has conferred far greater favours than this. Cultures have been made consisting solely of the wine fermentation plant; all other germs are checked or destroyed by "pasteurising"—a process I shall explain in my next lecture in connection with milk. These are technically called "levures," as the lactic acid germs are called "starters" at the butter factories. Wine-yeast is added to the must, instead of trusting to the mixed germs in the air. Thus, the fermentation is better, and the injurious bacteria are excluded. When this was done it was discovered that the "bouquet" and flavour of different wines was the result of the special species of wine-yeast used—the germs have some specific inherent or acquired characteristics. Thus, it is claimed that the vigneron can at will convert ordinary must into the most delicately flavoured claret, hitherto so costly as only to be obtainable by the very wealthy. Not merely must we introduce special varieties of vines, but we must make or import cultures of particular yeast-plants to enable our wines to become a valuable article of commerce.

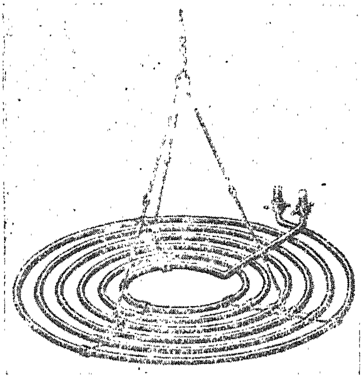

Fig. XI.

Now let us turn to milk. In my next lecture I shall show you some of the dangers connected with the ordinary public milk supply. At the present moment I am going to deal with milk only as the source of our butter and cheese. These, like wine and beer, are the result of bacterial action. There is a particular microbe at work, known as the lactic acid germ. Dairy bacteriology, as it is called, has made just as great strides as wine bacteriology. As we found in the latter case, so in this the flavour and quality depend on the nature of the germs used and the careful exclusion of hostile microbes (Fig. XII.). The "ripening" of the milk by the lactic acid germ is greatly hindered by many of the other germs that can easily gain access to the churns, particularly by one (the bacillus *coli communis*), which is found in millions in the digestive tract of all animals. In the hands of dirty dairymen, when cows are milked in filthy stalls or in yards contaminated with manure, these germs are sure to gain access in numbers (Fig. XIII.). "Bitter" milk is the effect of one germ, and "bitter" cream of another; there is a micro-organism which produces slimy milk, and so on. It is actually possible to recover from milk drawn near a pigsty a germ which reproduces the horrid smell of a piggery. Absolute scrupulous cleanliness is the first lesson taught by bacteriology (Fig. XIV.). Just as we can make our

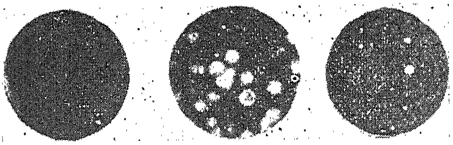

Fig. XII.—Microscopic appearances in good and bad butter.

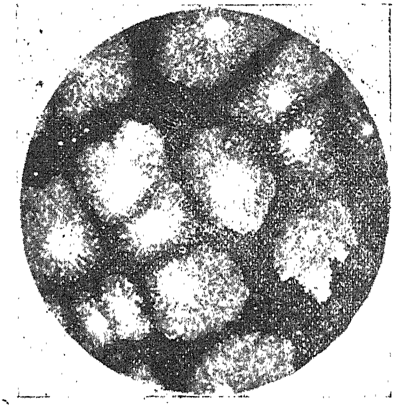

Fig. XIII.—Colonies of the Colon Bacillus, superficial and deep.

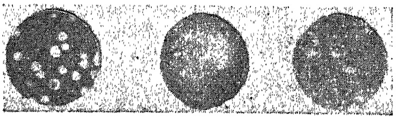

Fig. XIV.—Germs in butter after two months' cold storage.

wine suit any palate at will, so can we procure a special flavour for our butter by proper selection of the germ that makes it. Exactly as wine-makers are obtaining pure cultures of wine-germs instead of trusting to the mixed infection of the air, so are butter-makers using special cultures of the butter micro-organism. These have received from the factories the name of "starters." I do not think anything of the kind has been attempted in this State, but in New South Wales Professor Potts, F.C.S., has done good work in the way of bacteriological research in the milk-flora of Australia. In a paper read before the Australasian Association for the Advancement of Science, a copy of which he kindly forwarded to me, he mentions that in time past several factories had developed "starters" of their own from the buttermilk from the churns. Under such conditions there could be no certainty that undesirable bacteria, yeasts, and moulds were not present. He also points out that the "rancid butter" flavour, the "fishy" taste, and other objectionable qualities sometimes detracting so seriously from the commercial value of the product are all due to the presence of hostile germs. It is as important to exclude these as to obtain a good quality of the right one. The conclusion he draws is that all factories and butter-makers should secure a bacteriologically tested pure culture to use as a starter. Mr. Martin, the Secretary for Agriculture, gave instructions for the preparation and issue of pure cultures to anyone applying for them, and we must hope for similar enlightenment on our side of our island-continent. In order to secure this the bacteriological department made a minute examination of the germ life—or to use a botanical phrase, the "milk-flora"—of the milk from those factories which obtained the best price for their butter in the London market. Their experience confirmed that of scientific men in other parts of the world—that not only are bad flavour, ropiness, blue milk, etc., due to germs that ought not to be there, but that the *good* flavour was due to some inherent or acquired character of the lactic acid germs themselves, which some specimens possessed in greater perfection than others. After innumerable experiments, they selected bacteria from the Garvoc factory. In these they found several important features. "The flavour," they reported, "is naturally acid, but possesses a distinctly pleasant, nutty, butter aroma." There was no gas given off, showing the complete exclusion of the bacillus of manure; and there was an entire absence of bitter taste or bad smell (Fig. XIV.). From these germs as a starting point they made pure cultures, and distributed them to various factories. In order to test the result of their experiments, they selected two samples of butter from the Kyneton factory and sent them to Messrs. Dalgety's agent as an expert. One of these was made from pure culture of "Garvoc" starter and pasteurised cream, and the other was the ordinary product of the factory. Marks were given for various points, such as colour, flavour, aroma, etc. Taking the choicest butter procurable on the market as then worth 100s. per cwt., the sample made from Garvoc culture was considered worth 98s., and the other one as 94s. Four pounds per ton was the reward of the extra skill and knowledge.

Moreover, butter made from pure culture kept sweet for 22 days; the ordinary output, only seven. Now, I will give you the experience of a tiny country in Europe which will show you how far behindhand we are here in Western Australia, and also what huge sums of money lie in a knowledge of bacteriology such as is not beyond the limit of acquirement by the peasantry of a foreign country, and therefore certainly quite within our grasp. In Denmark, in 1888—15 years ago—not one sample of butter shown at the Odense Exhibition had been made from pure bacterial cultures. Six years later nearly half the samples had been so produced, and in 11 years a complete revolution had been effected, for as far back as in 1899 every specimen exhibited had been produced in this way. Picture that! every single dairy adopting bacteriological methods in those few years, and long before we have begun to do so! I think they deserved to succeed; and you will not be surprised to learn that they have done so. By the time they had mastered the modern method of butter-making they had captured the London market, sending thither 163 millions 880 odd thousand pounds weight of butter, worth over four million sovereigns—a veritable gold mine! They have gone on increasing since, besides sending quantities of cheese. Denmark has 15,000 square miles against our million and a quarter. There is still room for competitors in the British market; for besides this huge quantity, and what her own farmers can produce, England imports another 200 million pounds weight. If our farmers do not care to glut the London market, one is tempted to wish they would stock the Perth one.

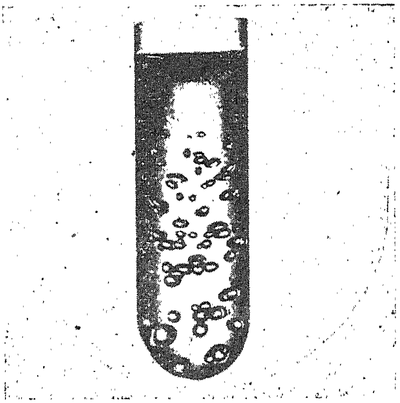

Fig. XV.

Cheese-makers have the same report to make as the butter factories. Whenever careless, dirty ways prevail germs gain access to the milk, which are injurious to the cheese-making process. The flavour and aroma of cheese is just as exclusively due to the germs as in butter. As you can get costly claret out of mediocre must if you know how, so you can get Stilton or Gorgonzola at will by obtaining the proper cultures. The very holes in Gruyère cheese are the action of microbes! Again, the process of changing grass into hay or ensilage is the performance of the yeast-germ. It is quite on the cards that horses daily receive a certain amount of liquor with their feeds by the conversion of the sugar in the heads of the grasses into alcohol. When hay heats too much in the process of curing, this is evidence of the presence of a hostile germ, one that flourishes best at temperatures of 140 to 160 degrees, a heat that causes most other germs to sicken or die. This same germ makes the cotton-bales on board ship become overheated. The end of its unlawful deeds in this case, as sometimes in the haystacks in England in a wet summer, is to cause spontaneous combustion. To pour water on the burning cotton is highly dangerous, as the bales are compressed hydraulically, and may swell up sufficiently to burst the ship. The final act in the drama is, too often, a ship posted "missing" at Lloyds. No doubt the day will come when starters will be used for hay and ensilage fermentation as well as for wine and butter.

The benefits that farmers have received are by no means limited to the vineyard, the orchard, and the dairy. The fertility of the soil and the effect of manures are just as much due to microbial action as the others. It needed a long time to prove this. Pasteur, forty years ago, surmised it, but many bacteriologists tried in vain to give indisputable proof. It remained for Winogradsky, of Zurich, quite recently to show definite results. It appears that the germs specially concerned will not flourish on the ordinary nutrient-gelatine plates, or, indeed, on any *organic* substance, and that was why they were missed by previous investigators. Nowadays gelatinised silica is used as a medium. To fully grasp this question a little chemical problem must first be studied. A considerable proportion of the air consists of the gas known as nitrogen, which enters largely into the composition of our tissues. Strangely enough, no living animal, and hardly a single plant, can take the nitrogen which it needs, and which is all round it, directly from the air. It has to be obtained in the form of food by animals, and in an indirect manner from the soil by plants. Germs take animal tissues to pieces and restore them to a condition suitable for vegetable nutrition, and so complete the circle. We build up; they take to pieces. From dust we came; to dust we must return. Were it not for this we should have heaped round us masses of remains of past plants and animals. After animals have used their tissues the waste nitrogen comes away in the form of ammonia, a pungent gas that most of you have inhaled in the form of smelling salts. Being a gas, it necessarily rises into the air, instead of remaining in the soil, and thus is lost to the rootlets of the growing plant. Now, comes a germ, produces nitrous acid, and changes the ammonia into nitrites. Another germ manufactures nitric acid, and further oxidises this into nitrates. Thus the insoluble nitrogen becomes soluble nitrates, capable of being absorbed by the rootlets, to become sap, just as the insoluble starch stored up in grain became soluble sugar to feed the seed before it had produced roots Manure is the waste product of animal and vegetable tissues being converted into ammonia, nitrites, and nitrates by microbial agency. It follows, therefore, that if while the manure is ripening the gases can escape freely, the precious nitrogen will be dispersed into the air, instead of being converted into valuable soluble substances, and also that the manurial value of the products of various sewage processes is nearly *nil* because the nitrogen is not in a soluble form. I will now show you two specimens of wheat planted in sterilised soil and watered with distilled water, to try and prevent any nitrifying germs gaining access except when deliberately introduced. In one case these germs were added in the other withheld. You see one set of plants has stooled, and they seem fairly vigorous, while the others are barely alive (Fig. XVI.). Scientists are making pure cultures of nitrifying germs, and selling them to farmers under the name of "Alinit." When guano is used instead of stable manure the same thing happens. The nitrates which are shipped all the way from Peru to serve as "artificial" manure are merely organic remains—seaweed, probably—which have been oxidised. The disagreeable odour that hangs about a midden heap or accompanies decomposition (note the accuracy of the word, taking the composition to pieces) is due, not only to ammonia, but other gases such as marsh gas, sulphuretted hydrogen, etc., which are injurious, or even poisonous. The varying conditions of climate, heat, cold, prolonged drought, excessive wet, all modify the germs. The organisms in the earth do not work at a lower temperature than 42 degrees. In England the soil is below that throughout the winter. Later on, when the weather is warmer, and the microbes are hard at work, plenty of nitrates are formed. Their special value consists, as I have pointed out, in their solubility. The consequence is, that in rainy weather all this goodness is washed out of the soil as fast as it is formed, unless there is a growing crop to seize it and fix it. Thus a catch crop sown in the autumn and ploughed in, retains the nitrogen, and slowly fermenting through the winter, yields it up gradually to the nitrifying bacteria in the following spring. Here in Western Australia our soil is rarely below 42 deg. in the cold season, consequently growth continues through that time; while

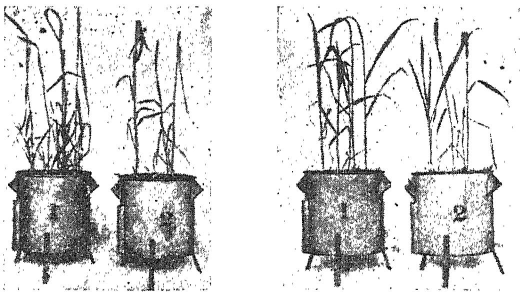

Fig. XVI.

our summer is so dry that any nitrates left over will not be washed away. As soon as the first rain comes in autumn plant life revives, and everything becomes vividly green. Tillage and cultivation, by letting the air into the soil, enable the nitrifying germs, which are aërobic in their nature, to work well, and thus manufacture quickly the stores of soluble food for the tender rootlets. Mr. Helms, of the New South Wales Agricultural Department, has tested soils from all parts of Australia, New Guinea, etc. He found that, as a rule, when the samples of earth were sent to him quite dry, the nitrifying power was lost, or almost. The chief exceptions were in specimens from Western Australia. Five samples from Coolgardie, for instance, all produced nitrification, some vigorously; while five out of six from Mount Narryer did so. As these germs are aërobic, they can only live near the surface. Thus they must have adapted themselves to their environment, and learned to exist in a dry state.

There are some micro-organisms which have a reverse action, which change nitric acid into ammonia, and so cause the loss of precious nitrogen. You see how close the analogy is in the path of discovery in the matter of fertilisers and in wine and butter-making—first the fact that the action was due at all to a microbe was astounding—then we find that we have friendly germs to encourage and hostile ones, in the form of the denitrifying organisms we are now discussing, to exclude. Anon we shall find the parallel even more complete, for we can get pure cultures of microbial fertilisers as surely as we can obtain butter starters or true claret yeasts. The unconscious aim of the farmer has been to increase the number of nitrifying organisms and check the too-free multiplication of the denitrifying ones. Now the advance of science makes his aim more accurate. Some nitrification goes on in ordinary soil without the aid of manure. Sir J. B. Lawes grew wheat without it for 50 years at Rothamstead. For the first eight years there were 17 bushels, for the next 20 14½ bushels, then 11½ to the acre. For many years agriculturists have been familiar with the fact that certain leguminous crops, such as peas and lupines, when ploughed into the ground were as beneficial as a dressing of manure. The microscope told a tale about this. It was found that on the rootlets of these green crops were many little nodules all full of bacteria. Further investigation showed that these micro-organisms had the power entirely lacking in higher organisms, ourselves included, of taking up the nitrogen they needed direct from the air. Drawing from the inexhaustible stores of the atmosphere, they could live without receiving any nitrogen from the soil at all. In the very early stages of growth the pea and bean tribe need a little nitrogen in the soil, but as soon as the germs have time to form the plant apparently takes its nitrogen from its bacteria, and so builds itself up without impoverishing the soil. When it dies it yields up this material to the nitrifying germs, and so enriches the ground. In this way is explained the fact that clover and lucerne will grow for years without any manuring. If they flag it is not from lack of nitrogen as in the case of most other plants, but because they have exhausted some other ingredient of the soil, very often the lime, which the nitrifying germs seem to need. Then a dressing of gypsum restores them to full vigour. A German professor is making pure cultures of these nitrogen-producing germs, which he sells to farmers to sow with their suitable crops. He calls his culture nitragin. Farmers in future instead of ordering guano will please wire for a pint of nitragin. Some day it may be that the professors will manufacture food direct in laboratories, but in the meantime the agricultural community can lay by against such a very rainy day for them by getting double crops at a twentieth of the cost in manure. Much attention is also being devoted to the best means of neutralising the action of the denitrifying germs which cause the loss of so much nitrogen. After all I have said as to the money-making results of the dry-as-dust investigations in scientific laboratories, the superior butter and cheese and wine and the fertilisers, surely farmers will take off their hats to the bacteriologists?

There are other trades which owe them an equal debt. Time would fail me to tell all. I will just allude to a few. Purple and fine linen seem to go together in one's mind. I showed you in my first lecture what lovely colours—purple is among them—bacteria can produce: to them also we owe fine linen. Before flax can be converted into the snowy tablecloth the fibres have to be separated from one another. This is done by steeping them for a long time. The waters of certain districts have long been known to be more effectual in accomplishing this than others. The why and the wherefore has been left as usual to bacteriology to unravel. The fibres are stuck together with an acid gum called pectic acid. There is a special micro-organism which breakfasts, lunches, and dines off pectic acid. Where these gentry abound the process of ungumming the fibres is quickly and thoroughly performed. In future instead of taking the flax to pools where these germs abound we can take the germs to the flax in the form of a flask of pure culture of these useful microbes. The brewer, too, has reaped just as much profit from the learned professors as the wine-makers. Not only must he avoid introducing moulds and other hostile germs just as his brother the vigneron must, but even of the yeast plants which he wants some are injurious — "wild" yeasts they are picturesquely called. Curiously enough some yeasts rise to the surface and most of the fermentation takes place there—"top" fermentation it is called. Others, again, sink to the bottom of the wort and produce "bottom" fermentation. English brewers use yeast of the top-fermenting variety, but the Germans prefer bottom fermentation.

Brewers have a great pull over wine-makers. They can boil their mash which sterilises it. It would hardly be possible to boil the grape pulp. Then they add a pure culture of yeast, then hops, whose essential oil checks subsequent growth of injurious germs. To show what influence the special germs have, wine has been made out of malt, and the malt flavour has been got rid of subsequently, so that no one would have suspected its origin.

Tobacco manufacturers have not been neglected by the bacteriologists. Each variety of tobacco with its different aroma is made by a separate variety of germ. Laboratories are supplying bacteria which possess the power to convert the crudest leaf into the choicest Havannah. Australian tobacco is becoming the rage among the working classes in England one hears. Our Agricultural Department might do worse than concern itself with the development of pure cultures of the Havannah microbe. They might thereby set going a new set of farmers, and a new city industry.

Ginger beer (the humble tipple of the school-boy) actually needs two germs for its production, whose action has not been beneath the notice of scientists.

There is another way in which bacteria have become the friend of man—by killing his foes. They have been used to kill vermin that would otherwise devour the crops. As long ago as 1888, Pasteur (you see what a universal genius his was, we always seem to go back to him) suggested inoculating rabbits with chicken-cholera to save Australia from being overwhelmed by their fabulous fecundity. At that time, however, it was believed that chicken-cholera was unknown in this country, and men hesitated at introducing a new disease which would probably be as fatal to domestic poultry as to wild conies. However, quite recently Mr. Pound, the Queensland Government Bacteriologist, has declared that the disease is common in the poultry yards around Brisbane. If this is so, and there seems no reason to doubt it, the experiment may yet be tried, for in other respects the idea is a very hopeful one, inasmuch as the chicken-cholera bacillus is quite harmless to men and to stock. What can be done in this way has since been proved elsewhere. Not long after Pasteur made his suggestion as to infecting Australian rabbits, a most alarming plague of field mice threatened the wholesale destruction of crops in Greece. Professor Löeffler, of Germany, had discovered a germ which was peculiarly deadly to field mice. Food contaminated with these microbes was placed in the fields. The disease rapidly spread far and wide, and in a very short while the hordes of field mice were thinned out in the most satisfactory manner. These bacteria are equally fatal to house mice. As these gentry are now proved to be susceptible to the dreaded plague, we may yet have to use the remedy against them here. This particular bacillus does not affect rats, but one has lately been isolated which does. As cats, dogs, poultry, cattle, sheep, and pigs, are immune to this germ, it might well be tried.

Bacteriology has money in it in yet another way, that is, to run a stud farm for micro-organisms. As I mentioned before, they are kittle cattle to feed. I fear there will be no eight hours' day for the farm-hand in microbe work. There are many of these laboratories. They give guarantees of purity of breed.

As a rule, their warranties are more to be relied on than in the case of food supplies. I fear we could still find a grocer who bids his assistant "sand the sugar and come to prayers." Professor

Potts, of New South Wales, seems, however, to have had an unfortunate experience. A number of lactic acid germs, in powder form, were imported from five of the principal laboratories in Europe, and a few from America, but none of them proved to be pure cultures. Mrs. Percy Frankland, in her admirable book, "Bacteria in Daily Life," says, "The antecedents of a microbe may be said to be regarded as of as much moment and to be as zealously preserved as is the pedigree of the most ambitious candidate for honours at a cattle or dog show." I hope I have now for ever dispelled the horror of germs which still seems to pervade even the educated classes. You see how inestimable is their value to the human race.

I think I have said enough to convince you of the great importance of bacteriology. I may say I have had a definite object in view in these lectures. In a democratic country there is, sometimes, an impatience at expending money on purely scientific objects. People naturally want to see an immediate return for their money. I have endeavoured to show you that learning acquired by abstruse science in a biological laboratory has proved worth millions to countries wise enough to make a practical application of abstract knowledge. I hope, therefore, that one of the results of these lectures will be a more keen desire to see installed in our midst learned men, equipped with all the appliances of modern investigation. Our Premier has taken the first step towards the establishment of a University in West Australia. I feel sure he will welcome every support you can give him in his endeavour. I hope, when the University is established, that its first aim will be to encourage original research work. Scientific investigators are the scouts of the army of knowledge. They do not know what they are going to find. They have to push out far into unknown regions. They need initiative and originality. They can rely only on themselves. The indications they gather have to be assimilated by men of scientific training, who, like cavalry, can travel faster than the rank and file. To complete my simile, the work of the vedettes and cavalry is no use unless the solid battalions follow close after. What good will Pasteur's investigations do us, unless we put them into practice in our dairies and our wine cellars?

ANNUAL REPORT.

Department of Agriculture.

The Honourable the Minister for Lands.

I have the honour to forward, herewith, the Annual Report of the Department of Agriculture for the year ending 30th June, 1903.

The 12 months under review have witnessed continuous and rapid progress in the development of our agronomical and pastoral resources, the increase of settlement in the rural districts being highly satisfactory, while there is also a perceptible improvement in the methods of cultivation employed. The State has also been fortunate in the class of settlers who continue to arrive; generally speaking, they are steady, hard-working men, with a limited amount of capital at their command, and a good knowledge of agricultural work. The excellent results of the last harvest, taking into consideration the vagarious climatic conditions of the year, combined with the high market values ruling—consequent upon the prolonged and disastrous droughts experienced in the Eastern States—have also had a beneficial effect in encouraging increased land settlement. This is particularly emphasised by the fact that in 1902 no less than 550,630 acres of land were taken up for agricultural purposes, as compared with 351,999 acres during the preceding year. The State is still, however, a large importer of all classes of agricultural produce, and when it is considered what an enormous area of excellent agricultural country, served by a suitable rainfall, still remains in the possession of the Crown in an undeveloped condition, it is greatly to be deplored that so many desirable residents from the Eastern States of the Commonwealth are drifting to South Africa and other countries. The Director of Agriculture of Victoria, in the course of a recent interview, stated:—"The lands of the State which could be utilised for closer settlement are practically exhausted, and in any case those which are available are too far away from markets and railway communications to induce the sons of farmers, with a little money, to settle upon them. I know numbers of farmers' sons whose fathers could provide them with a certain amount of money to establish homes of their own, but could not afford to pay them sufficient wages to remain at home, and who are consequently drifting away." While such a condition exists in Victoria, this State is in need of agricultural settlers to supply the requirements of our local markets, while there are millions of acres of first-class farming lands awaiting development within the boundaries of our agricultural districts. Consequently this drift of population from the Commonwealth is greatly to be deplored. Our agriculturists have shown the highly productive character of our soils, as during the past five years the average wheat production of the State has been 10·82 bushels per acre, as compared with 7·79 in New South Wales, 6·63 in Victoria, and 5·18 in South Australia, and as last season we had 107,167 acres under cultivation for cereals it must be admitted that Western Australia has long since passed the experimental stage in wheat production. It is now an established and rapidly progressive industry, and when it is considered that last season we averaged in this State 10·54 bushels, as compared with 5·9 in South Australia, 3·28 in Queensland, 1·29 in Victoria, and 1·2 in New South Wales, it is evident that the disastrous droughts which periodically affect the agricultural conditions of the Eastern States deal but lightly with the Western lands of the Commonwealth.

OFFICES OF THE DEPARTMENT.

Towards the end of the year under review the offices of the Agricultural Bank and the Stock Department were removed from Pier Street to West Australian Chambers, so that at the present time all of the branches under the Agricultural Department are concentrated under the one roof. By this arrangement the business of the Department will be greatly facilitated, and opportunities will be afforded for a more economical conduct of the clerical work.

STAFF.

During the year Mr. George Buchanan, who held the position of Chief Inspector under the Insect Pests Act, resigned from the Department to accept an important position under the Lands and Surveys Department. I am pleased to know that Mr. Buchanan's valuable services will not be lost to the State, and that in his travels through the country districts, in his new sphere of work, he will still be enabled to give orchardists the benefit of his advice.

Mr. T. Hooper, who has been associated for some time with the Department, succeeds Mr. Buchanan as Chief Inspector under the Insect Pests Act.

An important change has been effected in the Stock Branch of the Department by the retirement of the Chief Inspector of Stock (Mr. J. Morton Craig) on his pension. Mr. Craig has been a valued officer of the Stock branch for thirty-one years, and it is mainly through his energy and unwavering enforcement of the State's enactments that scab was eradicated from our flocks. It was a gigantic undertaking, considering the enormous area of the country and its wooded condition, while Mr. Craig also experienced considerable opposition from the settlers. His valuable advice in stock matters will be greatly missed, as Mr Craig had such a general and extensive knowledge of the country.

NOXIOUS WEEDS ACT.

With the small amount of money available to work with, every effort has been made to hold the spread of "Stinkwort" in check, but the Act itself is so cumbersome and costly to administer that I am afraid very little practical good will result from the year's operations. I am in hopes that the Bill prepared for the consideration of Parliament during this session will provide an Act of greater assistance to the Department.

FINANCIAL.

From the balance sheet attached it will be seen that the total expenditure was as follows:—

	£	s.	d.
Salaries	5,532	4	2
Contingencies	9,673	17	11
	15,206	2	1
Less revenue	6,256	17	2
Leaving an apparent net expenditure of ...	£8,959	4	11

IMPORTATION OF INSECT PARASITES.

During the year the Government Entomologist (Mr. Geo. Compere) has been engaged in the work of securing from the Eastern States and abroad the parasites of our various orchard and farm pests. In his search for these parasites he visited China, Japan, California, and various parts of America, Spain, France, and Italy, and his efforts were attended with unqualified success. Not only was Mr. Compere, through his travels, placed in possession of a vast amount of important information relative to the reduction of devastating orchard pests to comparatively harmless insects through the agency of their parasites, but he was enabled to secure and safely land within the State several parasites which will, at no distant date, make their presence in our orchards beneficially felt.

Mr. Compere was also successful in discovering parasites of the Codlin Moth, so that in the event of this dreaded pest causing trouble to our orchardists in the future, the Department is now in a position to obtain and employ the best means to hold it effectually in check.

With the object of continuing his search for the parasite of the fruit fly, it is the intention of the Department to again despatch Mr. Compere to foreign parts, and as the Entomologist is sanguine of success, I am confident he will have the sympathy and good wishes of all orchardists in this State while on this important mission.

THE ADVISORY BOARD.

The Advisory Board met on a number of occasions during the year, and the thanks of the rural public is due to the members for the time and attention they devote to the work of the Board. At the same time I think it would be advisable for the Board to meet periodically at regular intervals, and that a notification of the subjects to be discussed at each meeting should be forwarded each member in advance to enable them to prepare before attendance at the meetings.

PUBLIC MARKETS.

The Government contemplate taking over the Perth Public Markets at an early date, and hope to work them on a more satisfactory basis.

WORK OF OFFICERS.

Much good work has been done by the officers of the Department generally, and I would like to take this opportunity of placing on record my appreciation of the loyal and energetic assistance rendered me at all times by the officers of the Departments under my control. The attached reports indicate the large volume of work that has been performed, and I am confident they will be read with interest.

HORTICULTURAL AND VITICULTURAL EXPERT.

As the area under vines and fruit trees extends year by year, so the work of the expert increases, and his services are now greatly in demand. To obviate this increasing demand for personal advice from the Expert, Mr. Despeissis devoted much time during the year to the publication of a new edition of his useful work, entitled *A Hand-book of Horticulture and Viticulture,* which publication is now available for the use of growers.

FIELD OFFICER.

Mr. Wicken's time has been fully occupied in lecturing throughout the country, and in the conduct of experimental work. Mr. Wicken's report shows that the total area under crop throughout the State last year was 227,359 acres, but as the value of our agricultural imports amounted to £1,151,088, it will be seen that a very large sum of money is still sent out of the State for produce which might readily be grown within its borders.

GOVERNMENT REFRIGERATING WORKS.

The transactions of the Government Refrigerating Works show an increase of revenue for the season of £600. The expenditure has been also increased, owing chiefly to a slight increase in the consumption of coal and gas, and to freight charges. As you will see, the railway freight expenditure amounted to £230, and the *per contra* railway account for ice to only £21.

BOTANIST.

During the year further supplies of the Heart-Leaf poison were forwarded to the Colonial Institute for experimental investigation, and pressed specimens of the common poison plants were supplied for the use of the Defence Department, while such of the indigenous *Coniferæ* of Western Australia as were procurable were forwarded to the Technological Museum at Sydney for scientific investigation, at the request of Mr. R. F. Baker, Director of that institution.

Extensive exchanges with seeds of native plants, and sometimes living plants, have been made with foreign countries and the Eastern States, and in some cases these have been distributed throughout the country districts for experimental purposes.

CHIEF INSPECTOR, INSECT PESTS ACT.

You will observe, from his report, that this officer estimates the area now under cultivation with fruit trees and vines at 11,000 acres, and are distributed over a range of country from Northampton to Albany.

It is unsatisfactory to note that the San José scale has spread considerably during the year, while the Black and other scale pests have established themselves in a number of orchards. In some instances scale parasites have been liberated, and the result of their operations will be watched with interest, as the labour of fumigation and spraying is tedious and costly to the orchardist.

POULTRY EXPERT.

During the year Mr. F. Robertson was appointed as Poultry Expert to the Department, and this officer has since devoted much time to lecturing throughout the country districts, and in disseminating useful information to the public through the agency of the *Journal.*

With the object of preventing the spread of ticks and contagious diseases, Mr. Robertson also makes frequent inspections of the poultry forwarded to the markets and sale rooms, which in the past have been the chief distributing centres.

BEE-KEEPING.

The Bee Expert refers in satisfactory terms to the expansion of this industry, but deplores the fact that a large quantity of honey is still going to waste which, with closer attention, should be marketed. The latest returns compiled by Mr. Sutton show that there are now 243 settlers keeping bees, and they have a total of 4,991 hives. Mr. Sutton also regrets that very few of our fruit-growers have yet recognised the advisability of keeping bees, and he refers to the advantages to be gained through the increase of fruit production where plenty of bees are kept to assist in fertilising or pollenising.

RABBIT DIVISION.

In the course of his interesting report you will observe that the Secretary to the Rabbit Division refers to the gradual increase and advance of rabbits in the State, and that the rodents have extended their operations to a point North of Erlistoun. The advance has been most noticeable during the last few months, the exceptionally good season in the Goldfields Districts having assisted them to a considerable extent.

Mr. Wilson also reports that the whole of the South-Western Districts are now protected by fence against the invading rabbit; contracts are in hand for its extension North; and the barrier fence line has been surveyed and pegged out for 584 miles by Mr. Surveyor Canning.

STOCK DIVISION.

The returns supplied by the Acting-Chief Inspector of Stock indicate that the pastoral industry is in a flourishing condition, and that the State is gradually overtaking the demand for meat with local supplies. Increased attention is being directed to the selection and stocking of our pastoral country, and the large importations of high-grade stud stock during the year augurs well for the future.

Attached are the annual reports of the various officers under my control.

W. PATERSON,
Director of Agriculture.

30th August, 1903.

Insect Pests Act.

ANNUAL REPORT.

JULY 1, 1902—JUNE 30, 1903.

THE DIRECTOR,—The orchards and vineyards within the State number over 3,200 (or a gain of about 200 over last year), with an estimated area of 11,000 acres. The areas of most orchards are continually being increased. Some orchards, which a few years ago were only five acres, are now nearer 20. These orchards range from Northampton in the North to Albany in the South, a distance of about 450 miles. To cover this large amount of country we have five field inspectors, whilst another is stationed in and around Perth to watch the auction rooms and shops for the purpose of checking the spread of fruit fly and other diseases. It was the auction room inspection which first led to the unwelcome discovery of the codlin moth in this State.

This pest was found to have established itself in four gardens in North Perth, and all the fruit in these gardens was at once stripped, and all found infected was immediately destroyed. These orchards are now under quarantine, together with 17 surrounding gardens, so that we shall have complete control of them during the coming season.

The codlin moth was also discovered in the town of Albany in four gardens; these were treated the same as the Perth gardens and quarantined, together with two adjoining gardens. The two outbreaks together total eight gardens infected, and 27 under quarantine.

THE SAN JOSE SCALE.

This pest has been discovered up to date to have infected 295 orchards. Of this number about 106 orchards have been cleaned. In 1902 it was found on 2,109 trees, as compared with 3,228 trees up to the end of June, 1903, but the figures for 1903 are misleading, as not more than half the winter inspection, "the time for inspecting and treating the San José Scale," has been done. This shows that San José is spreading considerably as regards the number of trees, and the inspectors will require the thorough co-operation and assistance of the growers if this disease is to be stamped out. Thorough fumigation has been proved to be the only way to do this. Spraying only acts as a check, in so far as it will reduce the scale on one tree from millions to hundreds, but at the same time the scale will spread to many adjoining trees, whilst fumigating the tree infected and adjoining tree stamps the disease completely out. But the work must be most thorough to insure success.

Owing to the San José Scale requiring a tree-to-tree inspection, the work is very slow, and the five inspectors have all their work cut out to get the inspection done before the winter is over.

Another scale, the *Lecanium Cymbiforme*, is now known to exist in 99 gardens around Perth and suburbs, and many young scale are at present hatching out. In eight of these gardens the valuable parasites brought by Mr. Compere, our Entomologist, have been liberated, and will, I trust, keep this practically new scale in subjection.

The black scale which infests our citron trees so badly are also being parasitised by the little flies introduced through Mr. Compere, and we hope to get one of the most valuable species of parasite from the Cape about September next.

Unfortunately the fruit fly is still as strongly in evidence as in past seasons, but, bad as it is, it is nothing compared to what it would be if it was not for the hard work done by the inspectors during the summer. Last season there were 280 cases of fruit seized at the auction rooms and shops infected with the disease, and there is no doubt that second-hand cases are the most prolific means of spreading this dreaded pest. This fly is now known to have a very wide range, being distributed throughout the South of Europe, Island of Teneriffe, Capetown, etc., and in some of these places destroys the whole of the fruit crops; whereas in this State, owing to our system of inspection, it only takes a percentage.

The orchardists are compelled to pick all diseased fruit from the trees, and keep the ground cleared daily of all fruit and thoroughly burn or boil it. By these means millions of maggots are destroyed.

A scale, nearly new to West Australia, *Parlatoria Zizyphi*, was found on a citron tree in St. George's Terrace, Perth, and the tree was immediately burnt. This is the second tree found infected with that scale in this State, the other being a tree in Mount Street, some two years ago, which was similarly treated.

It is to be hoped we shall continue to keep out the many serious pests that infest other countries which up to the present we are free of, and at the same time, by the introduction of beneficial parasites and scientific methods, lessen, if not altogether annihilate, those we already have.

T. Hooper,
Chief Inspector.

2nd July, 1903.

Return of Fruit Imported into Western Australia during the Year 1902-1903.

	Bananas.	Lemons.	Oranges.	Apples.	Quinces.	Passion.	Pears.	Cherries.	Pines.	Loquats.	Plums.	Gooseberries.	Apricots.	Pomeloes.	Various.	Fruit, Grand Total.
Fremantle	15,238	8,749	12,414	33,354	101½	550½	4,542½	4,173	217	63	7,864	1,207	533	212	463	101,174
Albany	214	528	486	1,307	...	5	366	247	1	...	668	56	173	...	134	4,487
Esperance	2	6	21	92	2	...	32	3	...	...	25	4	1	...	18	196
Geraldton	13	...	...	35	...	...	33	...	5	...	55	...	...	93	...	234
Total Cases Fruit ...	15,467	9,283	12,921	34,788	103½	555½	4,973½	4,423	223	63	8,612	1,267	707	305	615	106,091

Return of Fruit Trees and Plants Imported into Western Australia during the Year 1902-1903.

	Ornamental.	Almonds.	Apples.	Apricots.	Cherries.	Figs.	Lemons.	Limes.	Mulberries.	Oranges.	Peaches.	Pears.	Plums.	Small Fruits.	Various.	Vines.	All Ports, Total.
Fremantle ...	30,904	259	13,534	427	60	58	414	25	82	8,998	4,054	2,180	1,831	2,443	204	190	104,187
	3,100	314	9,994	2,394	395	127	275	...	806	5,528	7,807	2,910	3,382	760	2,446		
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	286		
Albany ...	1,701	121	16,146	591	907	109	235	7	65	549	2,001	1,868	1,656	3,715	458	...	34,956
	...	22	1,969	177	51	60	72	...	35	97	428	469	249	2,586	212	...	
Bunbury	6	...	161	36	...	...	...	...	...	60	24	2	...	1,275	46	...	1,610
Geraldton	50	...	...	...	...	...	...	...	...	25	...	...	...	...	...	...	75
Esperance	...	6	24	48	30	6	12	...	...	18	66	24	36	94	...	...	364
	35,761	722	41,828	3,673	1,443	360	1,008	32	988	15,275	14,380	7,053	7,154	10,873	1,652	190	141,192

Return of Fruit received at all Ports for year ending 1st July, 1903.

	Cases.
Fremantle	101,174
Albany ...	4,487
Esperance	196
Geraldton	234
Total	106,091

Return of Plants and Trees received at all Ports for year ending 1st July, 1903.

Fremantle	104,187
Albany ...	34,956
Bunbury	1,610
Geraldton	75
Esperance	364
Total	141,191

Fruit Destroyed for Diseases, Decay, etc.

	Cases.
Fremantle	11,493
Albany ...	302
Geraldton	14
Esperance	—
Total	11,809

Annual Report of the Government Botanist.

The Director,—I have the honour to report on the work done by me during the year ending 30th June, 1903, as follows:—

Identification of Plants.—Specimens of all kinds of native and foreign plants were received for identification and report, and included the following introduced species:—*Homeria collina, Raphanus raphanistrum, Sisymbrium iris, S. officinale, Brassica sinapistrum, Trifolium tomentosum, Cerastium vulgatum, Bartsia latifolia, Carduus marianum, C. pycnoscephalus, Bromus arvensis, Elymus avenarius, Trifolium agrarium, Reseda luteola, Linaria spuria, Hypochæris radicata, Polypogon monspiliensis, Carduus lanceolatus, Centaurea calcitrapa, C. melitensis, Holcus lanatus, Lolium italicum, Eragrostis abyssinica, Panicum miliacena.* Among the indigenous plants were: *Morchella conica, Colus hircadinosus, Tephrosia purpurea,* and *T. lamprolobisides, Solanum esuriale* (berries sought after by aborigines), *S. orbiculatum, Sollya heterophylla* (greedily devoured by sheep), *Andropogon exaltatus* (scent so powerful that bushmen will not camp near it), *Callitris verrucosa, C. Drummondii, Actinostrobus pyramidalis, Rhagodia obovata (?)* (the red berries stain the fœces and intestines of birds feeding on them).

Poison plants were frequently received, and included: *Euphorbia Drummondii, Homeria collina, Gastrolobium truncatum, G. bilobum, Tephrosia purpurea,* and *T. lamprolobisides* (used by aboriginals for poisoning game), *Tersonia brevipes (?), Acacia sp.* (astringent).

Tests were made on guinea pigs of various solutions, prepared from *Macrozamia Fraseri,* by Mr. S. S. Dougall, Chemist to the Department, and a separate report has been furnished of the trials made.

A further supply of heart-leaf poison was forwarded to the Colonial Institute for experimental investigation, and pressed specimens of some of the commoner poison plants were supplied for the use of the Defence Department.

Supplies of such of the indigenous *Coniferæ* of Western Australia as were procurable were forwarded to the Technological Museum at Sydney for scientific investigation, at the request of Mr. R. F. Baker, Director of that institution.

Special reports were furnished on native drought-resisting Leguminous Plants, suitable for cultivation, with a view to the enrichment of the soil in nitrogen; and on the microscopic appearances seen in a deposit taken from the pipes of the Perth Water Supply.

The list of West Australian plants, compiled by the late Baron von Mueller for the West Australian *Year Book,* issued in 1896, was augmented by the addition of many new species recorded up to March, 1902. This enlarged list was published in the *Year Book* for 1900-1, and again this year in the reprint, entitled "Notes on the Natural History, etc., of Western Australia."

Seeds of native plants, and sometimes living plants, have been sent to or received from California, Manilla, Kew, Cambridge, Edinburgh, Berlin, Belgium, Japan, South America, Melbourne, and Sydney. Small supplies of the seed of the Yerba Maté, or Paraguayan Tea plant *(Ilex Paraguensis)* were obtained from South America and distributed to residents in this State, with instructions for its treatment before sowing, but it is yet too early to expect definite reports as to success or failure of the trials.

Much interest in the indigenous plants of this State is taken by horticulturists abroad, who show a desire for seeds or plants, so that they may introduce them into cultivation for useful or ornamental purposes; and I have endeavoured to supply these wants, to a certain extent, by collecting as many as possible about the Swan River, and also by forwarding such seeds as have been received from correspondents in various parts of the State.

Herbarium.—Early this year a herbarium press was provided for portion of the store of specimens gathered together during the last six years, so that their classification and arrangement are now more feasible, while their accessibility and usefulness will be thereby increased. In May, also, the standard books necessary for the identification of Australian and other plants were at length received, so that the proper and effective study of the plants now in, or to be added to, the herbarium is now possible.

One hundred (100) specimens were received on the exchange basis, and 60 sent out, while 140 were added by purchase. Collections made near Sampson's Brook by Mr. Berthoud, and from Coolgardie and other districts through the Forestry Department, were also received; while other contributions from distant parts of the State were made by Messrs. M. C. Davies, B. T. Goadby, F. H. Hann, J. Tyson, F. H. Vachill, J. Wellstead.

All the specimens stored in cupboards were subjected to carbon bisulphide in an iron chest, specially constructed for the purpose, in order to ensure the destruction of insect life in the bundles, which were afterwards wrapped in paper for future security.

An excursion for the study and collection of the native Flora was made in spring to the Stirling Range, in the south of the State, and the period between 26th September and 26th October was spent there. The district was traversed along the northern side of the Range, from Tenterden on the west to Ellen's Peak at the extremity of the Range, with diversions southwards among the hills at Red Gum Pass, Toll's Creek, and Ellen's Peak. The district bears a reputation for extreme aridity, but for two-thirds of the time spent there the weather was wet, and the rain sometimes very heavy. The season had been a wet one up till then at Tenterden, and the flowering of the plants was found to be at least a month behind the district round Perth, where last year it was some weeks later than usual. While it rained the creeks ran strongly, but all the water, it seems, disappears into the ground a short distance to the north of the range, feeding the innumerable salt lakes seen lying between the hills and the northern and north-eastern horizon. After a few days of fair weather, the water lying stagnant along the bed of the creek at the Red Gum Pass disappeared in large measure, till renewed by fresh showers. The soil is very poor, sandy, and stony, with saline depressions at intervals, except along the banks of the creeks as they issue from the hills, and to the east of Toll's Creek, at Warrungup, and Ellen's Peak, where the presence of better soil is shown by the re-appearance of large trees of white and red gum, the eucalypti at other parts growing as matlock from five feet to 12 feet in height. The higher peaks ascended were Ross Peak, at Red Gum Pass, Mount Toolbrunup, the loftiest of the range, at Toll's Creek, and Ellen's Peak at the eastern extremity overlooking the great plain to the north and east. Although some plants were found at or near the mountain summits exclusively, still the majority of those found there are seen also at their bases. The gullies are richly decorated with flowering shrubs, and the arboreal vegetation found there creeps up in the shelter they supply to near the summits of some of the hills, though they become more stunted as we ascend. The Red Gum (*Eucalyptus calophylla*) was seen with a trunk of six feet diameter in Red Gum Pass, while on the exposed stony hills the same species was met with under six feet in height, growing amongst other stunted eucalypti as matlock. In spite of the reputed aridity of the region, the native plants appear to thrive as well as in more favoured districts, and although some are stunted as compared with their condition elsewhere, the signs of actual death of plants were apparently fewer than in other parts. This would show that, on the one hand, the vegetation is suited to its invironment, and on the other hand, that the supply of moisture is better maintained in the deeper layers of the soil than at the surface. Settlers and passing travellers find it difficult to procure water for their daily needs, but an underground supply may be as easy to tap as in other localities. The soil along and near Toll's and Ellen's Creeks, which carry the rainfall to the north, is of a light loamy character, providing good feed for stock in spring; and along the banks of these creeks are terraces where cultivation could be successfully carried on in winter and spring, and continued through the dry season by means of irrigation, which seems possible by damming up the watercourses at various points, where the bottom is formed of solid rock. Among the foothills on the north side of Ellen's Peak, one of the creeks runs through a circular hollow, like an amphitheatre, which seems like a reservoir already excavated, and waiting to be turned to a profitable use.

Of the rich Flòra of the district a large number of species were collected, forming a considerable addition to the herbarium of interesting forms from a region not often visited. The detailed study of these has been kept back by the large amount of roùtine work to be attended to in connection with the position of Government Botanist. Much of this might have been done by a youth after a little training, and as these details must of necessity increase constantly in number and scope, it will be necessary to provide assistance if the duties are to be carried on at all. The same work is only done elsewhere with the help of a staff of assistants, and if attempted by one person becomes mere drudgery and an unworthy waste of energy. Western Australia is the only Australasian State that has not had its botany worked out in detail, and its large area and peculiar Flora render it peculiarly favourable for the study of problems in the biology of plants, that have a direct bearing on the growth of the plants cultivated in their vicinity.

ALEX. MORRISON,
Government Botanist.

1st July, 1903.

Annual Report of Field Officer.

THE DIRECTOR,—I have the honour to hand in a Report of the work done in my branch of the Department during the year ending 30th June, 1903.

EXPERIMENTAL WORK.

Hamel.—Work on these plots has been carried out by the officer in charge, Mr. G. Berthoud, on the same lines as in previous years. A five-acre block was sown with a large number of varieties of wheat, which were grown for seed, and a full report on these experiments was written by Mr. Berthoud and published in the May and June numbers of the *Journal.* This seed has been distributed among settlers in all parts of the country who applied for it, and the balance has been used for sowing other experimental plots. A similar series of varieties of oats, wheat, and barley, in addition to a number of grass plots, are now being laid out for the coming season.

Narrogin.—Considerable progress has been made during the past year at this farm; building, clearing, and fencing operations being in full swing. A cottage has been completed for the foreman, and a cart shed has been erected. The stable and barn—a large roomy two-storey building—has been completed, and a 16ft. aërmotor erected to supply power to the chaff-cutter, circular saw, corn-grinder, and other machinery. Students' quarters, which will provide accommodation for four students, and a large general room, together with two cottages for labourers, are contracted for and in process of erection. A large shed is being built to enable a supply of hay to be kept on hand after the coming harvest.

The greatest trouble experienced during the year has been the shortage of fresh water, there being only one small soak on the farm area, which goes dry early in the autumn. This necessitated water having to be carted from Narrogin, a distance of four miles, for all purposes, and was a considerable handicap as it took horses which might have been used to better advantage. This, I hope, is a trouble which is not likely to occur again, as we are taking steps this winter to provide a supply to carry us through. The well has been completed and we had to go to a depth of 75 feet to obtain water. This water is brackish and only suitable for stock purposes. A 12-ft. Samson windmill has been erected and pumps the water into a 20,000 squatters' tank erected on the top of the hill, from whence it can be gravitated into several paddocks. A stone tank, of a capacity of 40,000 gallons, has been erected half in and half out of the ground, into which the roof water from the stables and other buildings will be run. Another tank will be sunk to catch the roof water from the students' quarters, and galvanised iron tanks will be attached to the cottages.

About 10 miles of boundary fencing has been erected and two miles of cyclone fence for subdivision and about one mile of subdivision fences around homestead to divide the homestead paddock into a number of small blocks suitable for different classes of stock.

About 140 acres of land are now cleared, and 90 acres are under contract for clearing at the present time. We have not been able to get as much clearing done during the year as we should like, owing to the scarcity of labour for this particular class of work, but hope to have a larger area cleared by next season. Last year we succeeded in getting about 36 acres under crop, from which we secured about 30 tons of hay; a very good result considering that most of it was sown late and the ground only just cleared.

This season we have about 85 acres sown as follows:—About 10 acres experimental plots, 4 acres of oats, 3 acres of barley, 2 acres of rape, 1 of rye, and the balance (65 acres) under varieties of wheat. The crop last year enabled us to keep our horses and stock during the year without any expense for purchase of feed; this season we hope to have a surplus. We should have been able to have sown a larger area except that we were short of horses, and the extra work involved in carting water, building material, etc. This trouble is now, I hope, over.

The stock at present on the farm comprises 5 draught and 1 light horse, 2 imported Ayrshire cows, 2 Ayrshire yearlings and 2 calves, 236 sheep, 5 lambs, and 1 Shropshire ram.

A poultry farm has been established, and a number of pens and houses erected. This branch will be reported on by the Poultry Expert.

The balance-sheet is as follows. Total expenditure to date, £3,410 19s. 7d., expended as follows:—

	£	s.	d.
Fencing account	502	19	4
Building ,, ...	930	17	7
Clearing ,, ...	408	18	0
Ringbarking account	94	17	4
Crop account No. 1	68	9	5
Crop ,, No. 2	16	1	11
Water conservation account	295	9	6
Poison grubbing ,, ...	44	14	0
Plant ,, ...	485	1	3
Labour ,, ...	249	12	1
Stock feed ,, ...	57	16	6
Stock ,, ...	256	2	8
Total	£3,410	19	7

During the year we have received £29.8s. 9d. for the sale of meat.

Experimental Work.—I am glad to be able to report that this year has seen a considerable extension in the experimental work. In addition to our work at Hamel, which has gone on as usual, we have started an experimental plot at the Narrogin farm, and have 10 acres of experiments with manures sown and also a number of varieties of wheat. Also at the estate of Mr. R. Burges, M.L.A., of York, we have a 10-acre block, and at Mr. V. Hamersley, of Newcastle, and Mr. J. French, of Northam, we have five-acre blocks of experiments. These gentlemen kindly placed the land at the disposal of this Department, which found the seed and manures, and sent a man who understood the work to sow the seeds and manures. I marked out the land into half and quarter-acre blocks, and the manurial experiments will make a practical analysis of the soil, and show what ingredients, if any, the soil is deficient in, and also show what varieties of wheat are most suitable for the district. The report on the results of these experiments should prove interesting, but they should be carried on for a series of years to be effective, as the results are likely to differ in different seasons.

The above plots are all by the side of the railway line (York) or by the side of the main roads, and are all labelled in large letters on a board at the end of every block, so that the surrounding settlers, or in fact anyone passing can see and note the results for themselves, and all the owners above-mentioned have agreed to allow the plots to be inspected by visitors at any time. In addition to the above plots under the control of this Department, we have supplied seed and manure for a similar series of plots to Mr. St. Jack at Mount Barker, and to Mr. F. Johnston at Dardanup. These gentlemen have been given instructions and will mark out the plots and sow the crop themselves. In all cases the manurial tests will be sown with the same variety of wheat as the settler is sowing for his main crop, and the varieties of wheat will be given the same manure as that supplied to the settler's own crop. This will enable the tests to be carried out under the same conditions as the surrounding crops.

At Gingin, on the estate of Mr. A. W. Edgar, an experimental plot has been laid out and sown with a number of grasses, for the purpose of testing their growth. The land was prepared and the labour supplied by Mr. Edgar; the Department supplying the seed and supervising the work.

Stud Stock.—The stud stock have been considerably changed about during the year, and a number of settlers have been largely benefited by the use of these animals. The progeny of these bulls are now frequently to be seen, and some very good animals were shown at the shows in the South-Western districts this season. The stud bulls are now placed as follows:—

Ayrshire Bull, "Peverill"; with Mr. W. Marsh, Guildford.
Ayrshire Cow, "Lady Louisa II."; at Narrogin Farm.
Ayrshire Cow, "Anna"; at Narrogin Farm.
Shorthorn Bull, "Pride of Argyle"; with Mr. Wilson, Meckering.
Dexter Kerry Bull, "Killarney"; at Geraldton Farm.
Dexter Kerry Bull, "Blythswood Fascinator" (injured); with Mrs. Brockman, Margaret River.
Dexter Kerry Bull, "Derry"; with Mr. R. H. Rose, Bunbury.
Jersey Bull, "Fowler Lad"; with Mr. S. Dvoreskey, Armadale.
Jersey Bull, "Progress Fairly"; with Mr. J. Partridge, Brunswick.
Jersey Bull, "Fowler King"; with Mr. J. Coombes, York.
Jersey Bull, "Lillian's Progress"; with Mr. Eastcott, Waigerup.
Jersey Bull, "Fowler Boy"; with Messrs. A. E. and F. M. Clifton, Brunswick.
Jersey Bull, "Fowler Bee"; with Mr. W. Clifton, Wokalup.

These animals are no expense to the Department, as they have to be kept in good condition by the settlers to whom they are on loan. The period for which they are lent to one man is twelve months.

Seed Distribution.—The seed distribution took place, as usual, in both spring and autumn, at which the seeds grown at the Hamel plots were distributed, free of charge, to settlers who had applied for them. A large number of packets were made up and distributed to all parts of the State.

General Work.—A large proportion of my time has been occupied in supervising the Narrogin farm and the experimental plots in different parts of the State. The balance has been divided between attending to papers in office, reports on various subjects, answering inquiries on agricultural matters by visitors, attending a number of agricultural shows, testing milk, etc. In addition to the above, I also accompanied Dr. Seffer (representing the Swedish Government) for a trip in the South-West districts, and also Mr. Krukoff (representing the Russian Government) for a like trip.

During the year I have contributed a number of articles to the *Journal*, published by the Department.

Agriculture in General.—Although a large area of land has been taken up in the country, and a considerable increase of settlement has taken place, the effect has not perceptibly increased the area under cultivation; but a great increase must shortly be noticed.

The total area under crop in the whole State is 227,359 acres—an increase of 10,000 acres over the previous year. The increase or decrease under the principal items of farm crops are:—

	Year ending Feb. 28, 1902.	Year ending Feb. 28, 1903.
Wheat	94,709 acres	92,052 acres
Maize	512 „	186 „
Oats	9,751 „	10,145 „
Barley	2,669 „	3,874 „
Hay	92,654 „	103,938 „
Potatoes	1,829 „	2,051 „

The yields are as follow:—

	1902.	1903.
Wheat	956,886 bushels	970,443 bushels
Maize	5,203 „	2,498 „
Oats	163,654 „	161,205 „
Barley	34,723 „	45,778 „
Hay	89,729 tons	91,018 tons
Potatoes	5,739 „	6,156 „

For the purpose of comparison, and to show the immense demand which is waiting the agriculturist to supply, I append the almost startling figures of the principal imports of agricultural products into this State for the past year, together with a note of the amount of duty on each item, which, together with freight and expenses, is in the producer's favour:—

IMPORTS, 1902.

Item.	Duty.	Quantity.	Value. £
Wheat	1s. 6d. cental	86,089 bushels	16,298
Oats	1s. 6d. „	638,912 „	96,946
Barley	1s. 6d. „	30,420 „	5,722
Barley (malting)	1s. 6d. „	31,360 „	4,654
Maize	1s. 6d. „	5,140 „	1,219
Cheese	3d. per lb.	1,156,859 lbs.	29,385
Butter	3d. „	5,730,149 „	310,584
Bacon	3d. „	2,949,556 „	110,626
Ham	3d. „	565,916 „	23,888
Eggs	6d. per doz.	1,471,293 doz.	71,885
Milk (preserved)	1d. per lb.	4,379,818 lbs.	78,427
Potatoes	1s. per cwt.	12,140 tons	62,555
Pease	1s. 6d. cental	6,553 bushels	1,759
Flour	2s. 6d. „	12,336 tons	116,831
Bran	1s. „	10,994 „	61,738
Pollard	1s. „	2,616 „	15,374
Hay	1s. cwt.	244 „	913
Chaff	1s. cwt.	695 „	3,318
Fruit (green)	2s. cental	...	23,812
Meat (fresh)	free	1,316,305 lbs.	21,514
Cattle for slaughter	free	8,856 head	102,640

These few items total £1,151,088—a large sum of money—which is sent out of this State for produce which might be well grown within its borders; and in addition to the above list there are preserved and dried meats, preserved and dried fruits, wines, and a large number of dried and preserved products of different sorts which might well be made from our own products, and no doubt will be as the price of produce in this State becomes more in accordance with that in the East.

It is also interesting to note that while we produced 25,537 tons of wheat, our importations of mill products (*i.e.* wheat, flour, bran, and pollard) amounted to 28,211 tons, from which we can conclude that we require to double our own production before we can supply our wants on the present basis.

PERCY G. WICKEN,
Field Officer.

23rd July, 1903.

Annual Report of Editor of "Journal" and Librarian.

To THE DIRECTOR,—I have the honour to report on the *Journal* and Library as follows :—

The Journal.—It is a pleasure to have to report that not only has this publication grown considerably in favour, but that the size has also increased by reason of the many valuable articles contributed by the officers.

In December of last year it was the pleasure of the then Hon. the Minister, Dr. Jameson, to confer on me the title of Editor; this considerably increased the responsibility.

The greater portion of my spare time at home has been taken up on work in connection with Mr. Despeissis' Handbook, which has since been published; the public having readily availed themselves of this most valuable work.

I have made trips to various outlying districts for the purpose of assisting Mr. Sutton in his initial lectures on bee-keeping.

I would again urge that the *Journal* should be made more use of by the various departments as a means of disseminating information of public interest.

The Library.—This has greatly increased by reason of the number of useful and up-to-date books on all matters appertaining to agriculture, stock-raising, viticulture, and bee and poultry-keeping. These are made use of by the public to a considerable extent. It is pleasing to note that on many occasions persons have expressed their thanks for the ready information they have been enabled to obtain through a perusal of one or other of the standard books just added.

The Museum has also come in for an increase of attention, a greater interest having been exhibited by the public in making themselves acquainted with the specimens of fruits, vegetables, grasses, and cereals that have been grown in this State.

As a recommendation, I would strongly urge that an "Addressograph" be purchased for the purpose of addressing the *Journals*, etc. The cost of this machine is about £20, and would pay for itself in less than two years.

G. CHITTY BAKER,
Editor *Journal*.

30th June, 1903.

Annual Report of Poultry Expert.

To the Acting Director,—The poultry industry in this State is in a very backward condition, as is proved by the large importations of eggs, which, during 1902, amounted in value to £71,885—being an increase of about £10,000 on the former year's figures. This State is a very large consumer of poultry products, the demand by the goldfields population for light and nourishing foods, such as chickens and eggs, being very great; but, unfortunately, for various reasons our farmers have not gone in for poultry-raising to anything like the extent that one would expect. The very remunerative prices obtained for grain, chaff, and fruit have so well satisfied land-owners that in many instances they have not felt inclined to make special efforts to raise fowls in any quantity, being satisfied to keep just sufficient to meet their own requirements. Others, who keep a larger number of poultry, pay very little attention to them, and consequently do not get satisfactory results. No system is followed, and little or no effort made to improve the quality of their stock; but before long all this is likely to be very much altered, as the reduction in prices realised for fruit, grain, and chaff will compel greater attention to be paid to other farm products, first among them being poultry; and by means of the information supplied by this department it is anticipated that the production of poultry and eggs will be very much increased.

With the object of supplying farmers and others with eggs and stocks of pure-bred poultry, extensive additions have been made to the runs and number of fowls at the State Farm at Narrogin; and a considerable amount of care was gone to in getting together strong healthy birds and good representative specimens of the various popular breeds.

Every means are being taken to disseminate information on poultry. Lectures, illustrated with lantern views, articles in the Department's *Journal*, the distribution of a pamphlet relating to poultry and their diseases, personal interviews, and personal visits to yards and farms all over the country, being undertaken. Lectures were given as follows, viz: at Wanneroo, Mundijong, Leederville, and visits to Kelmscott, Gingin, Cannington, Fremantle, Newcastle, and Narrogin. Several inspections were made of Perth and suburban yards affected with disease. Numerous letters have been answered relating to diseases and the general management of poultry. A large number of engagements have been made for the next five months to deliver lectures and visit shows and farms in various parts of the State.

F. H. Robertson,
Poultry Expert.

30th June, 1903.

Summary of Reports on Bee Culture, November, 1902, to June 30th, 1903.

Since accepting the position of Bee Inspector I have visited all those keeping bees in a large way, and any I found in the several districts. As those registered were mostly of long standing, I found that many of them had not kept any bees for some considerable time. This suggested the idea of striking out on entirely different lines.

In most cases, with only a very few exceptions, I found those who had bees were pleased that the Department had made the appointment, and anxious to receive any information I had to give; and thus, instead of simply inspecting, it was found necessary to give instructions and advice.

In accepting the position I was doubtful as to my fitness to fill the position with satisfaction to the Department, more so when I found that most people wished me to deliver lectures on bee culture. This was more than I had bargained for; still, I made the venture, and have every reason to think it a step in the right direction, seeing that several who kept a few hives without having given much attention thereto took a deeper interest in those they had and increased their stocks, while others are following in the same direction.

I found a great many with only a few hives had much trouble with the wax moth through not knowing how to deal with this pest, and while some few had been careless and gave no attention, most of them, I am pleased to state, followed my advice and instructions, which resulted in improvement and cleaner hives. Those having the black bees are mostly inclined to have the Italian bee, which will not allow the moth to get a foothold in their hives, thus keeping the pest at bay.

Several have reported signs of foul brood, but only in two cases had this disease got a firm hold. One took drastic measures at once and removed the bees into clean hives and burnt the brood, hives, and frames. The other came under my observation too late to deal with effectually, and I arranged with the owner to remove the clean colonies, leaving those affected until we had brighter weather.

In the Albany district I found a great many keeping bees that had made but little effort to market their honey, but on visiting those, and at the lectures given, I pointed out the folly of such a procedure; and I have reason to believe that many of those will, during the coming season, become honey producers.

My list now shows 243 persons keeping bees, with a total of 4,990 hives; but the great bulk are not producers, and only have a few hives. About 100 persons have about 3,100 colonies, which leaves 143, having a total of 1,890 distributed amongst them.

I have not any doubt but that in the near future this industry will expand considerably in this State, as without doubt very large quantities of honey are now going to waste, which, with closer attention, should add very much to the increase of the resources of this State. The idea that honey produced here is below the standard of the other States has now been dispelled; and with better methods, and the adoption of up-to-date plant, proper grading and clarifying, the day is not far distant when exporting must come.

Last season was considered an off-season, yet those 100 mentioned above produced over 120 tons, which has found a ready market in this State. It is a fact worthy of more than passing notice that very few of our fruit-growers have as yet fully realised the advantages to be gained in the increased yield of fruit-trees generally, where plenty of bees are kept, to assist in fertilising or pollenising. This matter has had my attention when speaking at the several lectures that have been delivered, and no effort on my part shall be lost in pressing this matter when opportunity offers.

May I be allowed to add that I hope efforts will be made to have the amended Act to the Contagious Diseases (Bees) Act of 1899 dealt with during the present session, so that persons keeping bees will be required to have the same registered yearly, and thus keep us in touch with them at all times.

30th June, 1903. JNO. SUTTON.

Government Refrigerating Works Report.

1ST JULY, 1902—30TH JUNE, 1903.

From the Manager to the Director, Department of Agriculture.

SIXTH ANNUAL REPORT.

SIR,—I have the honour to forward the Sixth Annual Report of the business transactions at the Government Refrigerating Works, for your information.

RE-OPENING OF WORKS.

The Stores were re-opened for business on 28th July, 1902, and closed for the overhauling of the machinery and other necessary repairs on 1st June, 1903.

The cool weather prevailing at the beginning of the year postponed lease arrangements and reduced business generally for several weeks.

REVENUE AND EXPENDITURE.

A detailed statement of revenue as per cash-book and expenditure as per vouchers, passed for payment up till 30th June, 1903, will be forwarded as soon as the financial year closes and all vouchers and accounts have been received. Meanwhile it is satisfactory to be able to report that there is an increase of revenue for the season of over £600. The items rents, storage, and ice all show increases. The expenditure is also greater, being chiefly due to a slight increase in the consumption of gas, coal, and freight, but none of which items are abnormal. It is worth noting that our railway freight expenditure amounts to over £230, and the *per contra* railway account for ice to only £21.

CONSIGNMENTS.

In addition to the large quantity of consignments stored under lease, and of which no note is taken, 12,500 packages have been received, noted, and redelivered without any loss or claim being made against the Department. These retail transactions involve much clerical and other labour for very little revenue, and the fact that during the six years which the stores have been open not a single package has gone astray is to be attributed only to very careful supervision and the checking system in force.

The consignments have been much the same in character as in former years, the very large increase in fresh killed carcases being the only development worth noting. The quantity of frozen meat passing through the stores has also increased from that of previous years, except the first, when all our stores for months were filled with frozen meat of various kinds.

THE STAFF.

The staff again this year has worked faithfully and well for the Department.

THE MACHINERY.

The machinery throughout has worked well this year, no mishap of any consequence occurring. I think the Department may consider itself very fortunate that, during the six years which the machinery has been running, it has not been called upon for any outlay beyond that for ordinary repairs. This, I think, is to be attributed to the careful handling of the machinery, the annual overhaul, and that the machinery has not for any length of time been overtaxed, thereby minimising the risk of a breakdown.

ADDITIONS TO MACHINERY.

Last overhaul an electric lift was installed to meet the requirements of the stores upstairs; and a distilling plant was also erected to distil the water for ice-making purposes. Both of these additions have fulfilled the purposes for which they were erected, with beneficial results.

THE STORES.

The Stores have been in more constant use than for several years previously. The electric lift made the stores upstairs more accessible, and in consequence they have been more frequently used. For several weeks, at one part of the year, all the storage accommodation at the works was occupied. This has not happened since the first year of opening, when over 7,000 frozen carcases, in addition to the ordinary work, were stored here for months.

THE FUTURE.

Running the Machinery all the Year.

The suggestion is often made that the stores should be kept open all the year, but this cannot be done with safety till such time as there is either an additional machine installed, or the present machine sold and two uniform machines of 15 tons put in its place. The question of whether the brine circulation should be continued or the air circulation adopted also arises. If it is an additional machine that is decided upon, then I would recommend that the present system be continued, as it has proved it can do its work well if it gets its conditions, and if two uniform machines should be fixed on, together with an air circulation; there are so many makers each claiming to be the best, that I recommend the makers should be communicated with for prices and information concerning their machines. The makers of our present machine (Hall and Co.) have also an air installation, and the British Guide, and the Hercules have a reputation for good work. The objection to the brine circulation is the moisture from the pipes, but an air circulation would not entirely do away with the moisture. The moisture here mainly arises from the over-stocking of the small retail stores, and the short time given to cool the meat; and the excessive opening of the doors. It can be easily understood that an air circulation would dry the meat quicker and carry away the moisture, preventing it from condensing on meat already cooled, and all this without the temperature being as low or lower than the temperatures carried here. There is another point which, on the other hand, favours the brine tank system, viz., that the storage of brine in the tanks and pipes permits the machinery to stop without endangering the temperature in the store.

The moisture, especially in the passages, is a very grave objection, but where there is such a mixed business as this is it cannot be avoided, except by running double shift continuously from start to finish, because it is when the machinery runs the shorter hours that the moisture is greatest.

IMPORTED FROZEN MEAT.

There are indications that the frozen meat trade is likely to expand. And now that the steamship companies are fitting their steamers with refrigerators, and the cool storage space being available, a larger business may be looked for.

ICE BUSINESS.

The Railway Department, I am told, intends to charge all its cool storage vans with ice from the Government Refrigerating Works next year. Up till the present an exception has been made in the case of Perth Fresh Food and Ice Co., which firm was permitted to charge with its own ice all the cool storage vans used by them. If the change takes place, it will mean a very much larger revenue from ice next year, and as some preparation for this increased business requires to be made, I recommend that the Minister for Railways and the Commissioner should be written to for definite information on the matter. The information required is: When they would start, how much ice would be required, and in what quantities at each time and how often.

CONCLUSION.

I think the season, as a whole, may be considered to have been fairly satisfactory, taking all things into consideration.

I have, etc.,

JOHN GRESHAM,
Manager.

4th June, 1903.

1902—1903.

				£	s.	d.
REVENUE COLLECTED AT THE OFFICE OF THE GOVERNMENT REFRIGERATING WORKS, AS PER CASH BOOK:—						
Rents				1,522	0	11
Storage				489	14	7
Ice				520	14	5
OUTSTANDING ACCOUNTS—	£	s.	d.			
Department of Agriculture	10	13	3			
Perth Hospital	0	9	0			
A. E. Ross	7	18	11			
				19	1	2
				£2,551	11	1

1902-1903.

Expenditure as per Vouchers Passed for Payment at the Office of the Government Refrigerating Works:—

	£	s.	d.
Salaries and Wages (Office and Stores)	542	17	4
Salaries and Wages (Machinery Department)	817	10	0
Coal	459	15	9
Freight	239	11	10
Electric Light and Repairs	108	11	10
Gas Company	77	8	1
Sanitary Service	5	3	4
Water	10	1	2
Calcium	9	6	9
Compound	15	15	0
Oils	38	19	6
Leather	6	15	0
Ice Delivery	20	1	6
Additions, Alterations, Repairs, Requisites	453	0	6
	£2,804	17	7

Deductions for Stock available for 1903-4:—

	£	s.	d.
Coal	1	11	6
Gas	35	15	0
Calcium	11	13	6
Leather	4	10	0
Oils	1	10	0
Compound	1	2	6
	£54	2	6

Items paid for but only proportionately chargeable to 1902-3:—

	£	s.	d.
Electric Lift	187	7	6
Distilling Plant, etc. ...	86	19	11
Water Tower and Cement Works, etc.	87	0	0
	£361	7	5

John Gresham,
1st July, 1903. Manager.

Some Comparative Statistics.

	1901-2.	1902-3.
Revenue as per cash book	£1,840	£2,532
Rents as per cash book	£1,255	£1,522
Storage as per cash book	£370	£489
Ice payments as per cash book ...	£216	£520
Large Ice stored	1,205 blocks	2,430 blocks
Small Ice stored	3,073 blocks	3,250 blocks
Large Ice supplied to Government Departments	60 blocks	7 blocks
Small Ice supplied to Government Departments	2,750 blocks	2,810 blocks

SOME COMPARATIVE STATISTICS—*continued.*

	1901-2.	1902-3.
Large Ice supplied to Railway Department	56 blocks	140 blocks
Value of Ice supplied to Railway Department	£8	£21
Large Blocks supplied to Vineyards	145 blocks	124 blocks
Number of Packages received, stored, noted and re-delivered, exclusive of consignments stored under lease	10,953 packages	12,500 packages
Cases of Butter stored	7,600 boxes	8,840 boxes
Number of Delivery and Cash receipts written out exclusive of book entries, files, memos., accounts, and other miscellaneous records	10,000	19,900
Quantity of Coal	621 tons	709 tons
Amount paid to Railway Department for freight	£179	£240
Cost of Ice delivery	£27	£20
Cost of Water	£18	£10

JOHN GRESHAM,
Manager.

1st July, 1903.

STOCK DEPARTMENT.

Report of the Acting Chief Inspector for the Year ending 30th June, 1903.

To the Director of Agriculture.

Stock Department,
Perth, W.A., 27th July, 1903.

SIR,—In forwarding this, my first Report, I have the honour to furnish you with a summary of the working of the Department for the past year. Owing, however, to my recent appointment as Acting Chief Inspector the report in detail will not be so comprehensive as it otherwise would have been. The returns, however, which I herewith submit will, I trust, be found to be as complete as those furnished by my predecessor in the past.

STOCK IMPORTATIONS.

It will be noticeable that there has been a falling off in the number of fat cattle imported for slaughter to the extent of about 2,600 head, and the decrease is likely to continue, which speaks well for the local production of the State.

The importation of stud stock, however, is largely on the increase, which is a sure sign that local stock owners are turning their attention towards improving the quantity and quality of their flocks and herds.

Of the 1,586 horses imported, a good number consisted of brood mares and draught sires; and these should materially add to our already fast-growing local supplies.

A well-selected number of Angora goats have been imported, the majority of which have gone to East Kimberley for the improvement of a herd which is already well-established in that district.

The following return shows the number and description of imported stock for the year:—

IMPORTATION OF STOCK FOR YEAR ENDING 30TH JUNE, 1903.

Port of Landing.	Horses.	Fat Cattle.	Dairy Cows and Heifers.	Bulls.	Sheep for slaughter.
Fremantle	1,093	3,875	979	118	62,215
Geraldton	1	...	...	...	...
*Eucla	51	84	...	2	3,156
Albany	135	...	22	4	340
†Wyndham	306	6,035	...	...	...
	1,586	9,994	1,001	124	65,711

Port of Landing.	Ewes.	Rams.	Pigs.	Dogs.	Goats.	Camels.
Fremantle	644	1,469	846	157	11	...
Geraldton	...	15	...	2	...	...
*Eucla	...	...	...	7	...	7
Albany	496	104	2	12	7	...
†Wyndham	...	...	...	17	...	...
	1,140	1,588	848	195	18	7

* June returns omitted. † Overland from Northern Territory.

The number of stock shipped to Fremantle from the North-West ports during the past 12 months shows an increase of over 4,500 from East Kimberley alone, which now makes this far North Province the chief source of our beef supply. The following is the return:—

STOCK SHIPPED TO FREMANTLE FROM NORTH-WEST PORTS.

From	Cattle.	Sheep.	Horses.
Wyndham	14,986	...	4
Derby	6,369	14,365	...
Other ports	306	30,382	29
Totals	21,657	44,747	33

EXPORT OF STOCK.

A second shipment of cattle, consisting of 2,000 head of young breeders from the East Kimberley district, left the Port of Wyndham for South Africa about 12 months ago.

It speaks well of this district that such large shipments of heifers can be made to foreign markets, but while such supplies are so much needed for the stocking up of our own country, it does not seem advisable, in the interests of the State, that such exports should continue.

FINANCE.

The expenditure of the Department for the year totals £4,193 4s. 10d.

The revenue received amounts to £1,231 4s. 4d., showing a deficit in revenue over expenditure of £2,962 0s. 6d., the deficit being greater this year than it has been since 1898.

Included, however, in the expenditure is an item of £693 12s. 5d. for the construction of a cattle dip and water supply at Owen's Anchorage.

The following shows the expenditure and revenue for the past year:—

Expenditure.

Items of Expenditure.	£	s.	d.
Salaries	2,495	5	0
Allowances	409	3	4
Labour occasionally required	145	17	6
Incidentals	227	18	10
Postages, telephones, etc.	60	18	0
Stationery, printing, typewriters	56	4	9
Travelling expenses	104	5	0
Forms J—			
(1.) Cattle Dip Construction ... (2.) Owen Anchorage Water Supply	693	12	5
Total	£4,193	4	10

	£	s.	d.
Expenditure	£4,193	4	10
Revenue	1,231	4	4
Cost of Department to the State	£2,962	0	6

The amounts collected from outside stations appear in the following return, Fremantle contributing the principal payments:—

Receipts.

Place.	Export Certificates.			Inspection Fees.			Yard Fees.			Veterinary Inspection Fees.			Yard Rents.	Water Charges.			Total Receipts.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	£	s.	d.	£	s.	d.
Fremantle ...	37	0	0	473	3	7	415	7	7	23	1	0	110	5	18	0	1,064	10	2
Albany ...	5	5	0	34	1	10	...			...			...	...			39	6	10
Geraldton ...	2	15	0	2	17	6	...			...			...	...			5	12	6
Eucla ...	...			27	19	4	...			...			...	...			27	19	4
Wyndham ...	...			81	8	6	...			...			...	...			81	8	6
Esperance ...	...			0	5	0	...			...			...	...			0	5	0
Perth ...	...			...						12	2	0	...	...			12	2	0
	45	0	0	619	15	9	415	7	7	35	3	0	110	5	18	0	1,231	4	4

WORK OF INSPECTION.

This work, as usual, has been chiefly confined to the Port of Fremantle, where a total of 71,407 head of imported stock were examined, together with the supplies from the Northern ports. The State has been practically free from any infectious disease for the year, until quite recently, when a slight outbreak of pleuro-pneumonia amongst a dairy herd was reported from South Fremantle. On inspection, one milching cow only was found to be affected. This animal was destroyed, and the balance of the herd inoculated, thus removing any danger from the disease spreading in that particular locality.

Several cases of impaction have been again reported from various parts of the State, some of which, under treatment, have recovered, while others, which were allowed to go too far, have terminated fatally.

The improvements made, by way of cultivation, and the more nourishing grasses which are now being sown, will prevent much of the losses which have occurred from this cause in the past.

I would strongly draw the attention of stock-owners to the necessity of immediately reporting to the Department any outbreak of disease among their stock, so that prompt measures may be taken to deal with such cases.

LAMBING.

Reports to hand from the various sheep-producing districts throughout the State are very satisfactory.

In the West Kimberley district, where the flocks are increasing in numbers year by year, a good lambing is already assured. That this district, with its splendid yearly rainfall and luxurious vegetation, is destined, in the near future, to become a large meat and wool-producing province, is beyond question. The North-West stations report stock in good condition, and a high percentage of lambing; the rainfall being fairly general throughout.

The Gascoyne and Murchison districts, with their large area of salt, cotton, and blue-bush country, report good rains generally; sheep in good condition, and the prospects of a good lambing in sight.

The Eastern, Southern, and South-Western districts all report good rains, but in some of the sheep paddocks feed short and backward by reason of so much cold and frost prevailing; this being chiefly the case in the South-Western district, where a few owners have reported small losses in lambs through native dogs having found their way into the lambing paddocks. The lambing, as reported from these districts, is progressing favourably, and good results are anticipated.

Sheep-tick continues to be a source of trouble to flock-owners, more especially in the South and South-West, these parasites appearing from time to time when the animals are in poor condition and carrying wool.

I would specially draw the attention of owners of tick-infested flocks to dip immediately off the shears. The benefits from so doing are two-fold, for besides eradicating the tick it cleanses the skin and greatly helps to promote the growth of wool—both in density of fleece and length of staple.

It is satisfactory to note that station owners throughout the State are alive to the fact that they must keep up the quality of their flocks if they wish to be in line with outside competition in the wool markets of the world: and with that object in view many good woolly sires have been imported of late and found their way into Northern and Southern flocks.

That Western Australia is essentially a wool-producing State is beyond all doubt: and everything considered, there will be a decided and substantial increase both in wool and mutton throughout the State for 1903. This, together with the high prices for wool now obtaining, cannot be considered as otherwise than satisfactory.

Tick Cattle.

East Kimberley reports splendid rains and stock in a healthy condition, with a large percentage of fats available for the Southern markets.

A serious loss, however, has again taken place amongst a mob of Sturt's Creek cattle travelling through to Wyndham. It appears this station—although situated within the quarantine area—is said to be free from ticks; and as each consignment of fats have to travel through tick-infested country to reach the port of shipment, the losses from tick-fever in each instance were very great, and for this reason some remedial measures should, if possible, be applied.

With the object of assisting to stock up the South-Western districts of the State and adding to our beef supplies, the question of bringing down stores from East Kimberley must now be dealt with, but in such a way as to make this trade practicable.

It is my intention to formulate a scheme which will ensure the safety of these animals being distributed throughout the clean parts of the State, and at the same time with advantage to the owners who may feel disposed to provide the supplies. Should the scheme prove effective, the cattle could be seen and disposed of at the port of Fremantle, which should be the most convenient place for intending purchasers.

Needless to state every care will be taken that the animals will be guaranteed clean before release is given, as all necessary precaution will be taken by the Department to avoid the slightest possibility of infection among the Southern herds of the State.

More liberal regulations are now being prepared for dealing with tick-infested fats on the Eastern Goldfields. A quarantine area, which will include Coolgardie, Kalgoorlie, and the Boulder, will be fixed and placed under official supervision, where these stock will be allowed to graze for slaughtering purposes. And later on a smaller quarantine area will be arranged for at Menzies. But, in my opinion, no tick-infested cattle should be allowed further North, even under strict quarantine, than Menzies.

The beef supplies for the smaller mining centres could either be slaughtered there or obtained from clean herds; the object of this being to guard against any infection being brought too near the herds of the Murchison or Gascoyne districts.

I am fully aware of the fact that cattle ticks will hatch on the Goldfields, but the risk incurred in having a large area set aside at Kalgoorlie is small compared to the advantages derived in providing a cheaper and better supply of beef.

The new regulations will also provide for a quarantine area for store cattle from East Kimberley, for use on the Eastern Goldfields, at Hine's Hill, near to Southern Cross, where they will be railed and detained for a period after further experiments with dipping have been made.

The present regulations for the disinfection of trucks used for the conveyance of tick-infested cattle to the Eastern Goldfields will also have to be amended; as, from experiments tried, the steaming of trucks in the open, no matter how carefully performed, is not satisfactory; and, in order to obtain the desired effect, each truck will have to be placed in a closed chamber and treated with a pressure of from 50 to 70lbs. of steam.

A very necessary work which the Government intend taking in hand at an early date will be the erection of public abattoirs at Owen Anchorage. This will have the desired effect of centralising the slaughtering of all animals placed on the market for human consumption, and will provide a more effectual mode of inspection. This, however, need not be considered as a means to the cheapening of our meat supply, because such can only be brought about when production becomes greater than demand.

R. E. Weir, M.R.C.V.S.,
Acting Chief Inspector of Stock.

RABBIT DEPARTMENT.

Report of the Secretary of the Rabbit Department.

The Honourable the Minister for Lands.

Sir,—I have the honour to submit the Annual Report of the Rabbit Department, for the year ending the 30th June, 1903.

The Staff,

At the close of last year the staff consisted of one inspector and three sub-inspectors in the field, and a clerk as assistant in the office. The latter officer was, on the 1st of July, transferred to the Agricultural Department; whilst one sub-inspector resigned at the 31st of December. The gradual expansion of the work necessitated the increasing of the staff of sub-inspectors by one on the 1st of November, and another on the 23rd of March. Boundary-riders had also to be appointed to look after the barrier fence as sections of it became completed; one boundary-rider beginning his duties on the 1st of February, another on the 1st of April, and a third on the 1st of June. The presence of rabbits in the vicinity of the fence line also necessitated the appointing of four rabbiters on the 1st of November. Two of these were subsequently transferred to occupy positions of boundary-riders.

The Inauguration of Fencing.

The fencing was begun at two points,—the railway line at Burracoppin, and the sea coast at Starvation Boat Harbour. From the former place it was extended southward and northward; and from the latter place, northward, with one or two intermediate sections. To endeavour to hasten the work, particularly at the coast end, where the rabbits appeared to be making the most head way, contracts were let in July for 20 miles of four-wired fence from the sea northward, and for 40 miles of clearing still further north. Though it is undoubtedly more economical to let the whole—clearing, fence erection, and netting-hanging—in one contract, the situation was one of such urgency that it was decided to get the work in the most threatened locality pushed as far forward as it was possible to do in the absence of the netting, and as soon as the latter arrived have these portions completed by subsequent contract.

INITIAL DELAYS.

For the first two fencing contracts, comprising the fifty miles divided by the goldfields railway line, the first netting to reach the State was only landed on the 8th of July. Tenders had been called for the supply of this netting as far back as the 18th of October, 1901, but unforeseen contingencies—entirely beyond the control of this Department—arose to prevent any of it being delivered before July. In like manner, the calling of tenders for the netting required for the continuation of the work from and towards the sea end, and which was requisitioned for as early as the 8th of November, 1901, could not, from the same causes, be effected till March, 1902, with the ultimate result that it was the 1st of October last before this netting began to arrive. In calling for these tenders—open to all competitors—the fullest information had been sought and obtained as to the earliest dates at which delivery could possibly be expected, and every effort was made to shorten that period with a view to expediting the work. The numerous orders on hand, however, prevented manufacturers meeting us to any extent in this direction.

CONTRACTS IN PROGRESS DURING YEAR.

At the beginning of the year all the fencing that it was possible to have erected up to that time was 20 miles of un-netted fence—part of Contract No. 1. The following contracts were, however, got under weigh and in progress during the year:—

Contract No. 1, being 25 miles of rabbit-proof fencing complete.
,, ,, 2 ,, 25 ,, ,, ,, ,,
,, ,, 3 ,, 145 ,, ,, ,, ,,
,, ,, 4 ,, 125 ,, ,, ,, ,,
Coastal Contract No. 1, being 20 miles clearing, and erection of 4-wired fencing.
Coastal Contract No. 2, being 25 miles rabbit-proof fencing, complete.
,, Netting-hanging Contract, being attachment of netting to 20 miles of 4-wired fence.
Coastal Clearing Contract, being 40 miles clearing of fence line.

With the exception of No. 4, the whole of these contracts were to have been completed during the year. The 30th of June, however, saw some 30 miles of No. 3 Contract, and also a few miles of No. 2 Coastal Contract still unfinished; and it was not till fully a couple of months later that the south-western portion of the State was closed against the invading rabbits, and the fence completed from the sea on the south, to about 100 miles north of the goldfields railway line.

THE WORK GENERALLY.

Owing to the absence of suitable timber for posts in places, it was found to be impossible to continue the same style of fencing throughout the whole length; and between the railway line and the sea, three different styles had to be adopted, viz.: forty-five miles of all wooden posts; twenty-five miles with one wooden post to every four iron standards; and 145 miles all iron standards, except the straining posts. The bulk of the iron material and other requisites for the fence was delivered to the contractors at Burracoppin railway station, though for the construction of some 80 miles of the most southerly portion the material was landed at Starvation Boat Harbour. The delivery at the latter place, where settlement existed, entailed a good deal of trouble and some little delays, owing to the difficulty of procuring freight from Albany or Fremantle within reasonable time of the landing of the material at these ports; the one or two schooners trading round the south coast affording the only means of reaching the harbour at anything like a reasonable cost.

The inhospitable nature of the country through which the fence passes, and the exaggerated reports circulated as to the prevalence of poison along the route, have been responsible for a good deal of trouble in the matter of carriage of material, and for some delays in the completion of the barrier between the railway line and the sea. Fortunately, owing to a rather favourable season, the water difficulty has not been so serious as was anticipated. The reluctance of contractors to venture upon this work of rabbit-proof fencing, and their various ideas as to what it is worth to do so, is shown by the difficulty that has existed at times in getting people to tender, and by the figures put in by those who have eventually sent tenders in. Thus, for clearing the line of fence, tenders ranged from £6 to £32 per mile. For erecting 4-wired fencing, the prices tendered were from £29 to £72 10s. per mile. For Coastal Contract No. 2—25 miles complete rabbit-proof fencing—three tenders were received, the lowest (an Afghan) being £48 10s., and the highest £108 per mile. The calling of fresh tenders resulted in prices from £75 10s. to £84 10s.; and a third calling of tenders for this section produced offers from £43 to £64 15s. per mile. For Contract No. 3—145 miles iron standard fencing—tenders had to be called twice before any offer could be recommended for acceptance, and the lowest then forthcoming—£59 19s. per mile—was exceedingly high for standard fencing, but, as the state of the rabbit advance permitted of no further delay, its acceptance was rendered necessary. For Contract No. 4—125 miles—tenders had to be called thrice, the first calling resulting in no tenders being received, in the second the tenders proved too high for acceptance, and on the third occasion it was let at £66 10s. per mile.

The fence line having been permanently surveyed to 369 miles north of the goldfields railway line, *i.e.*, to a point north-west of Mount Russell near the Peak Hill-Wiluna road, the work is now proceeding of establishing permanent water supplies along the fence line right up to this point; less difficulties are therefore likely to be met with by contractors throughout the remaining portion of the 584 miles at present surveyed, than presented themselves in the contracts now drawing to a close.

The endeavour to meet the requests of men of small means, to be given a chance to contract for the work, by letting portions of the fencing in short lengths of 25 miles, proved most unsatisfactory; trouble and delays resulting in almost every instance, and it was not until I received approval to let the work in large sections, that matters proceeded at all smoothly and with something approaching expedition.

ADVANCE OF THE RABBITS.

All the information received during the year points to the gradual increase of the rabbits throughout the country east from the barrier fence, from the coast on the south, to somewhere beyond Erlistoun on the north. Where twelve months ago the first traces of the rodents were only beginning to be discovered, it is now no uncommon thing for several rabbits to be seen. The advance has been most noticeable during the last few months, the exceptionally good season having favoured the increase of late. Whilst it is believed that the bulk of the rabbits now established in various parts of the goldfields originally followed the coast line from Eucla, the inspector reports that there are almost certain indications that they have also found their way across more central parts from the direction of Ooduadatta in South Australia. A certain amount of destruction is going on in places where they are plentiful in the neighbourhood of settled population, and I am assured that the number of rabbits already killed by private parties only a few miles from Boulder must total fully a hundred.

About the end of last year (June, 1902) traces of rabbits were first reported to exist at the fence line, nearly half way between the railway line and the coast; and three months later it was found that they had reached the vicinity of the said line at the sea end, and also at one or two other points. In fact, so consistent was their advance, that scarcely a road crossed the fence line along which some traces of the rodents could not be found. This serious development, coupled with the fact that no fencing was possible at this part for a considerable time to come, led me to place the facts of the situation before the then Hon. Minister for Lands, so that consideration might be given to the question whether, under the circumstances, it might be advisable to have the fence erected much further to the westward than the line originally surveyed, and within easy reach of, and about parallel with the Great Southern Railway line. This would ensure the fences being well ahead of the rabbits, besides affording greater facilities for cheap erection and maintenance. Were it possible to have the fence erected along the original line within six months, I expressed confidence in being able to stamp out any rabbits that might cross the line during that time. As matters stood, however, I could see no hope of having the fence completed between the goldfields railway line and the sea much under a year. The matter was referred to the Advisory Board of the Agricultural Department, who suggested the surveying of a new line. It was eventually found, however, that any line which would be at once ahead of the rabbits, and at the same time well outside the limits of all settled country, and country suitable for settlement, would require to be so far to the eastward of the southern railway line that no benefit from the latter would be obtainable; and the country through which such fence would have to pass promised to present difficulties if anything greater than existed along the old line. It was therefore decided that tenders be called immediately for the continuation of the original line of fencing from the goldfields railway to the sea, for completion within six months from date of acceptance of tender,. and that parties be put on to vigorously follow up and destroy any rabbits which might, in the meantime, have reached the fence line. These parties were successful in destroying five grown rabbits, besides a nest of young; and wherever traces have been found near or west of the fence line, the work of searching out and destroying is still going on. Unfortunately the fence contractors found it impossible to have the barrier fence completed within the stipulated six months (as a matter of fact it has taken them just a year from the date of my minute on the subject), so that the process of fighting the few rabbits that got through has had to be kept up for a longer period than was hoped would be necessary, and the certainty of overcoming all of them is not quite so great. As the lines along which the rabbits travel are now well known, however, and no effort is being spared to hunt down any odd ones that may have gained the west side of the fence, I have good hopes of preserving the country within the fence free from infestation.

The utility of the fence has already been made apparent by the numerous traces of rabbits which are now to be seen along the east side, and by the fact that four or five rabbits have already been captured in the trap yards which I have had erected at intervals along the fence.

Several reports of the presence of rabbits at considerable distances to the westward of the fence have arisen during the year. The first was a newspaper report in August to the effect that a resident of Fremantle had seen a rabbit only a few yards away from him, near Bibra Lake. Inquiries pointed strongly to a mistake having been made; nevertheless an experienced officer was put on to camp at the spot and thoroughly investigate, with the result that not the slightest trace of rabbits could be found, and the droppings which the informer produced in support of his statement were plainly not those of rabbits. Shortly afterwards came word of the existence of rabbit traces on the Darling Range, near Smith's Mill. This was inquired into, and a very brief investigation showed it to be correct. Steps were immediately taken to capture what rabbits existed, with the result that within a very short time one was secured. Had it been at all likely that this rabbit was one of the invading horde from the eastward, it would have proved a very serious state of affairs. There were certain features about the animal captured, however, which strongly pointed to its being an old resident of this part of the State, and in this opinion I was supported by leading zoologists here. As I mentioned in my last annual report, it is by no means uncommon for rabbits to exist in small numbers in places and make little headway, sometimes finally disappearing, the same locality often afterwards becoming the home of teeming thousands of the invading pest. I am credibly informed that many years ago rabbit shooting was a favourite sport around Greenmount; and this being so, I am not surprised that a remnant of the old stock should still be found. A thorough search was continued in the neighbourhood for some weeks, in case of others existing, but nothing could be discovered beyond the traces of the one captured. In October a report came to hand that numerous traces had been seen by an overlander on his way between the fence line and Narrogin. A chart was obtained from this man showing the route he had travelled, and with the places where he had seen the rabbit traces marked thereon. The country was then carefully searched over and over again by different officers of the department, but no sign of any rabbit traces could be found, and the Inspector unhesitatingly declares the information supplied to be untrue. In January a report of the presence of rabbits near Moora and Mingenew was made, and later on that one had been killed at Yatheroo. These, after careful inquiry and much time spent in searching on the spot, were proved to be without foundation.

WORK IN PREPARATION.

The barrier fence line having been pegged out for some 584 miles by Mr. Surveyor Canning, that officer is now making an examination of the country still farther to the northward, with a view to finding the most practicable route for a fence to protect the whole of the North-West pastoral country. Recently the question arose whether similar steps might not be shortly desirable with regard to the Kimberley country; and inquiries were made from the South Australian authorities as to whether the rabbits had proved themselves capable of crossing the more tropical desert country of that State. The information supplied showed that they had reached a little beyond the 26th parallel, but had failed to penetrate the inhospitable region further north, and exhausted themselves about the Musgrave Ranges. It therefore seems unlikely that the Kimberley areas will be menaced for a good many years. I think, however, that it is only a matter of time when they will succeed in finding their way across from the border of North Queensland by way of the Northern Territory, and probably also along our own North-West coast, beyond where the present fence enters the sea.

I have, etc.,

H. M. WILSON,

12th September, 1903. Secretary Rabbit Department.

SWINE FEVER.

[By J. D. STEWART, M.R.C.V.S., Government Veterinary Surgeon, Stock Branch, N.S.W.]

Although swine-fever has but recently been recognised to exist in this State, it is well known in other parts of the world, and a brief reference to its history will lead to a more ready comprehension of the serious menace its existence is to the pig industry. The following article is taken from a late number of the New South Wales *Journal of Agriculture*:—

HISTORY.

Available evidence points to the disease having been introduced into Great Britain from the Continent of Europe at some date prior to the year 1853. In the year 1862 the disease was found by Professor Simonds, of the Royal Veterinary College, among home-bred pigs on a farm near Windsor. Shortly after, it appeared in a widely disseminated form, and is stated to have caused a mortality often amounting to 75 per cent. of the affected pigs.

In 1878, Klein described, under the name of "infectious pneumo-enteritis," a swine epizootic in which the lungs, serous membranes, and intestines were specially affected. This pneumo-enteritis of Klein is identical with swine fever, as it agrees with it perfectly, clinically as well as anatomically. During the following year the disease was reported to exist in nearly every county in England, six in Wales, and three in Scotland, there being 2,765 outbreaks and over 17,000 swine attacked. In 1885 the disease attacked 40,000 pigs, of which 27,000 were killed and 10,000 died, while in the following year 35,000 died of the disease.

The Board of Agriculture received from Parliament on the 1st November, 1893, powers to order the slaughter of swine suffering from swine fever, and of swine that had been exposed to the contagion of this disease. The number of pigs that had been slaughtered as belonging to these two classes were as follows:—17,774 in year 1893; 56,296 in 1894; 69,931 in 1895; 79,586 in 1896, and 40,432 in 1897. Since then, notwithstanding the various measures enforced for its eradication, swine fever has affected the pigs in Great Britain each year with greater or less virulence. The latest returns to hand, comprising those for the first 19 weeks of the present year, show that there have been 541 outbreaks, causing the slaughter of 2,555 pigs.

The disease is stated to have made its first appearance in America, in the County of Ohio, in 1833. During 1877 and 1878, a generally disseminated swine plague raged for the first time in North America. Detmers in Chicago termed it "swine plague"; Law in Ithaca, "hog fever"; and the farmers, "hog cholera." The total loss in 1885 to the United States was estimated at

30,000,000 dollars. Alone, in Nebraska, 400,000 pigs died, in Missouri 200,000, and in Indiana, 400,000 during the year.

Although the disease existed in Germany and Austria before 1882, its nature was not recognised until Löffler and Eggeling elucidated it at that time. At the present day it is the most widely disseminated and most dangerous porcine disease in Germany.

In 1887, swine fever spread first to Sweden and then to Denmark, and from that period the epizootic became widely disseminated, particularly in Prussia, Hungary, and Servia. It was also introduced into France.

As regards Australasia, we now have record of its appearance in New Zealand, Queensland, New South Wales, and Victoria.

According to Mr. J. A. Gilruth, M.R.C.V.S., Chief Veterinarian and Bacteriologist to the Government of New Zealand, the first suspicion he entertained of the presence of swine fever among the pigs of that country, was in the summer of 1894-95. The existence of the disease was officially announced shortly after this, outbreaks having occurred at several centres. Vigorous prophylatic measures were at once put into operation, and in the course of time, the disease was regarded as stamped out. It, however, reappeared during December, 1901, in a piggery connected with one of the State institutions after an apparent absence of 12 months, inquiries failing to adduce any satisfactory explanation as to how it was introduced. In his report, Mr. Gilruth strongly advocates the complete inspection of all the pigs in the Colony, and, until this is carried out, it is impossible to state what degree of success has attended his effort to eradicate the plague.

With respect to Queensland, an outbreak of swine fever at Mackay was reported by Mr. J. McLeod, M.R.C.V.S., in August, 1899, and an odd case was subsequently reported to have been found in the vicinity of Brisbane. By slaughtering all the affected swine, quarantining the premises for six months, and exercising the usual precautionary measures, the Chief Inspector of Stock of that State claimed to have eradicated the disease a little over 12 months after its first appearance. A further outbreak recently occurred near Brisbane, but its reappearance is regarded by the Queensland authorities as being due to the introduction of diseased pigs from this State.

The precise date at which swine fever was introduced into this State, and the source from which it originated, are at present unknown. It was regarded as a foreign disease up to the beginning of April last, when I reported its existence here, although evidence since collected indicates that its introduction was by no means so recent. The first intimation the Stock Branch received of the prevalence of the disease was that a number of pigs were dying at Bondi, near Sydney, and I was directed to investigate and report as to cause of mortality. On visiting the locality, I was informed that over 100 pigs had died within the preceding two weeks, and that others were dying daily. The owners were alarmed, and, while anxious to do all within their power to check the spread of the malady, were uncertain as to what measures to adopt, as different opinions had been expressed by previous observers as to the cause of death, which had been attributed to pneumonia, brine poisoning, and heat-stroke on separate occasions. During my investigations I was more fortunate, as I saw several pigs that showed symptoms that indicated swine-fever; and, on making a *post-mortem* examination on the carcass of a pig that had died during the previous day, I obtained definite evidence from the appearance of the internal organs. As the organs of this animal were considered too putrid for bacteriological examination, I revisited the piggeries on the succeeding day, and made several additional *post-mortem* examinations, which furnished undeniable testimony of the existence of swine-fever. Recognising the desirability of having my diagnosis confirmed by bacteriological tests, several specimens of typical lesions were forwarded to the biological laboratory of the Department of Public Health. There tests were applied by Dr. Frank Tidswell, whose observations confirmed the diagnosis made, the bacteria isolated, and their pathogenic effects upon experimenting animals, corresponding entirely with those of type specimens and the description of authorities.

It recently transpired that the disease was found to be existing in Victoria on the 3rd March, 1903, and the latest reports indicate that it is fairly extensive in the Southern State.

NATURE AND CAUSE.

Swine fever is also known as "*swine pest*," "*swine typhoid*," "*hog cholera*," and "*contagious pneumo-enteritis*." It is a very malignant and exceedingly infectious disease, produced by a micro-organism which has the form of a short ovoid bacillus.

The bacillus grows at the ordinary temperature of the atmosphere, and is capable of preserving its vitality in spite of dessication for nearly two months. It is, however, destroyed by a temperature of 136° F. in from 15 to 20 minutes.

Cause.—The sole cause of the disease is the introduction into the animal's system of the specific micro-organism derived from a previous case of the disease. Exhaustion and exposure to cold and wet predispose swine to infection by lowering their vitality. Hardship and adverse influences in general may accelerate a latent infection, while insanitary conditions favour the development of the disease once it is introduced, and tend to increase its virulence.

Mode of Infection.—The chief channels of infection are the alimentary and respiratory tracts, the former more commonly. The mode of infection is considered by some authorities to determine the form assumed by the disease; thus plumonary form originates from infection by inhalation, and enteric from infection through the mouth by ingestion. Other authorities, however, do not consider pneumonia a constant manifestation of swine fever. Professor

McFadyean states that "with our present knowledge, we are unable to say whether pneumonia when it occurs in the course of swine fever is an adventitious complication or a consequence of the action of the swine fever germ." In the majority of affected animals upon which I have held *post-mortem* examinations in this State, the two forms have been found to exist concurrently. Still I have met with cases in which the lungs were markedly affected, while the intestinal lesions were represented by small areas of congestion in the stomach and about the ilio-cœcal valve, accompanied by a hæmorrhagic condition of the mesenteric lymphatic glands.

Period of Incubation.—The period of incubation of the disease under ordinary conditions, varies from one to three weeks.

SYMPTOMS.

Swine fever does not run a uniform course. In the same lot of pigs entirely different symptoms and forms of the disease may appear simultaneously. Owing to the variations shown in the manifestation of the disease, a typical description of the symptoms cannot be furnished under one heading. For practical purposes, it is clinically divided into a per-acute, an acute, and a chronic form.

1. PER-ACUTE FORM.—This form is very severe, and commonly causes death in from three to eight hours. It usually attacks pigs from three to six months old and fat stores, and consists of a highly-feverish hæmorrhagic inflamation of the lungs or of pure septicæmia. An animal that has just fed with a good appetite becomes suddenly and extremely ill. It suffers from shivers, staggers, and falls down. The temperature rises to 106° or 108° F. The pulse becomes frequent and irregular, while beating of the heart is almost imperceptible. Respiration is difficult and accelerated. Frequently a moist cough is present. There is great prostration. Sometimes a mucous discharge and bleeding from the nose is present. Red spots often appear on the skin about the ears, on neck, breast, and abdomen. Pressure over the region of the stomach gives pain, and the animal shows an inclination to vomit. The bowels may be tympanitic, and as a rule there is a certain amount of constipation present. The per-acute may pass into the acute form.

2. ACUTE FORM.—The acute form of swine fever usually appears as a pneumo-intestinal inflammation, which is sometimes complicated with various kinds of exanthemata of the skin. It is also a fatal form, and its duration varies from a few days to about three weeks. An affected pig is not easily roused, and generally does not readily answer the call of the attendant or the noise of the feed bucket as healthy pigs usually do. It is noticed to be the last to move at feeding time, and to walk up unsteadily in a dazed and drowsy manner. It exhibits little or no interest in what is taking place around it, and soon retires to seek quietness, rest, and shelter. Frequently there is a desire to vomit, the attempts sometimes being successful, but more often they are abortive. Thirst is always

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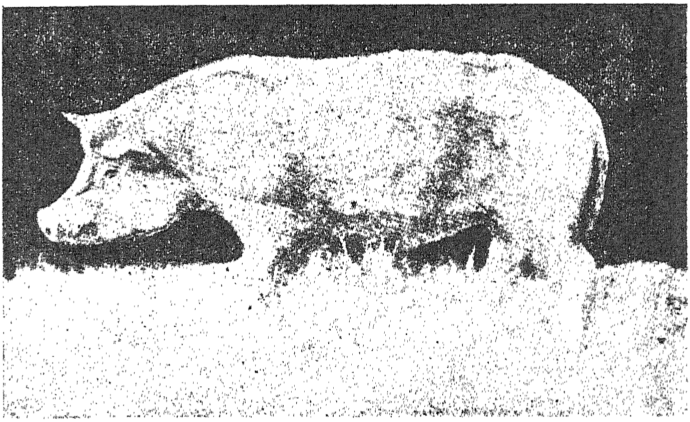

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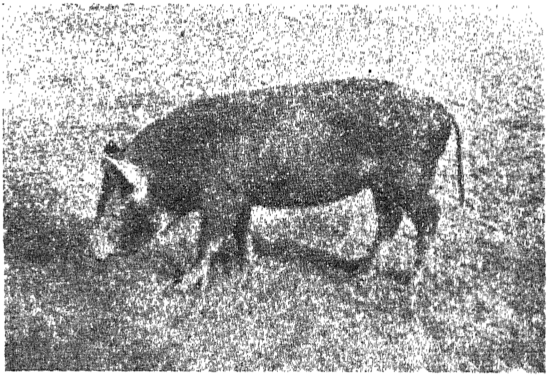

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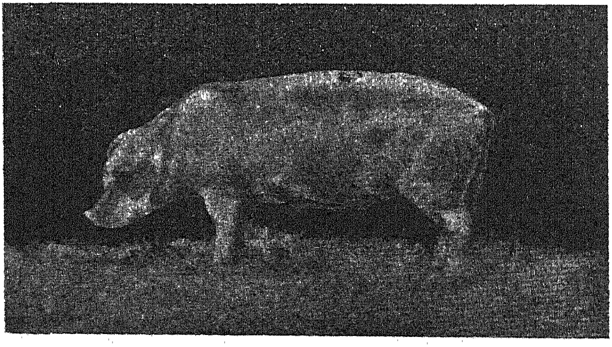


Nos. 1, 2, and 3.—Photographs of Pigs affected with the acute form of Swine Fever, showing characteristic appearances at different stages.

evident; the affected animal may be observed to lick at any available moisture, such as wet patches that collect in the crevices and depressions in the flooring of many sties. The back is arched, the head carried low, ears drooped, and the tail uncurled and limp. The eyes become sunken and a sticky discharge escapes from the eyelids, to which sand and dirt adhere, giving the eye a peculiar appearance that at once attracts attention. There is rapid loss of flesh, the ribs and spine become evident, and the flanks tucked up.

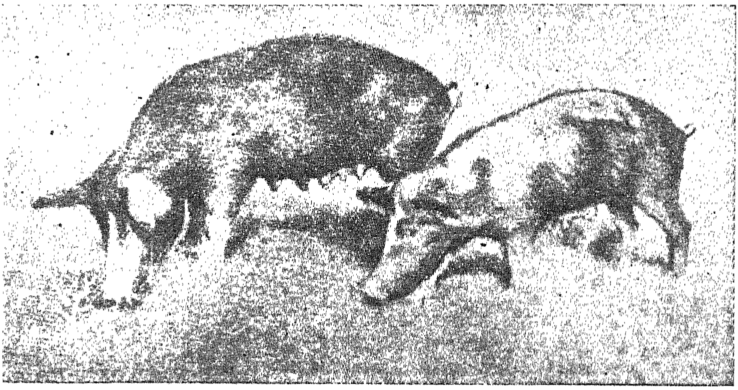
Loss of muscular power gradually becomes apparent and is especially noticeable in the loins and hind part of the body. The gait becomes staggering, the animal steps short and uncertain, while the body sways from side to side. If compelled to remain standing in one position for a minute or two, the whole body is seen to tremble or shake; particularly the muscles of the shoulders and thighs.

There is usually a pronounced fever, and the thermometer is consequently of great assistance in the detection of affected animals. In the early stages, when the fever is high, the bowels are usually constipated, although at the very outset a transient diarrhœa may be present. As the fever subsides a more or less persistent diarrhœa sets in, the motions become frequent and the dejecta vary in colour from black to grey, green, brown, or yellow, have an offensive odour, and are often viscid in nature, adhering to the sides of the buttocks and the tail. In the latter stages the motions are watery, and often the animal strains violently without any evident result. The stools at times are streaked with blood and large clots of blood may be mixed with the fæces or passed alone. During the fever the urine is scanty and high-coloured. As recovery takes place it becomes abundant and watery.

In grave cases, necrotic ulcers form inside the lips and on the gums and tongue. Abortion is of common concurrence. In sows suckling their young the milk supply is diminished or completely arrested, while the suckling pigs often die suddenly.

Pulmonary Symptoms.—The pulmonary form of the disease is first manifested by a short dry painful cough, which speedly becomes spasmodic, and occasionally lasts so long as to threaten suffocation. The breathing becomes of a heavy pumping or panting nature and the white of the eye becomes dark red in colour. The discharge from the nose is often frothy and profuse, while at other times it is scanty and glary (muco-purulent). Dull percussion sounds may be obtained over the chest wall, and auscultation proves the existence of suppressed respiratory murmurs. Occasionally symptoms of pleurisy and pericarditis become evident.

Changes in the Skin.—In many cases the skin shows no striking changes. In others there are more or less well-marked local symptoms of the disease, the most common being patches of red, dark-red, or bluish colour on the ears, under the neck, chest, and abdomen, inside the forearms and thighs and about the anus. These patches vary in size from that of a pea to a sixpenny piece, being most commonly well-defined, but occasionally becoming confluent and forming irregularly-shaped areas of discolouration. As the disease advances, the patches become darker, and in rare cases the involved skin dies and sloughs off, leaving ulcerous-looking sores.



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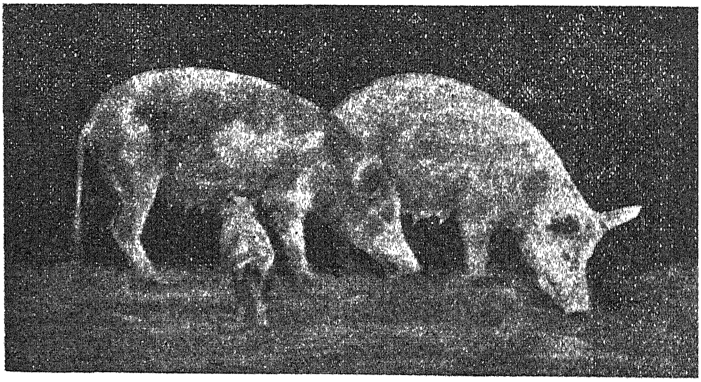

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Nos. 4 and 5.—Photographs of Pigs suffering the chronic form of Swine Fever.

3. Chronic Form.—The chronic form of swine fever may develop insidiously, or be the result of an acute attack. Its average duration is from four to eight weeks, but sometimes it persists for months. The eyes become dull and slightly sunken, the upper lids having a peculiar appearance owing to the loss of hair and desquamating cuticle. A sticky secretion is discharged from the edges of the lids, and the skin of the forehead becomes wrinkled. The hair (or bristles) stand somewhat erect, the back arched, the tail

limp and often straight, the ears dropped forward, and the animal exhibits a generally dejected appearance. Usually there is constipation, alternated with diarrhœa, which occasionally becomes persistent, profuse and fœtid, and rapidly brings the illness to a fatal termination. The affected pigs may eat a good quantity of food but they never improve in size or condition. They eat with avidity but are soon satisfied, returning to finish their meal after an interval of rest. When the lungs are extensively affected, there is a chronic cough and persistent breathlessness, together with great and continued emaciation. The skin usually has a scurfy appearance without any discolouration. As the disease advances, the animal loses condition, especially about the hind quarters, becomes anæmic and shows great weakness and signs of paralysis.

Although the above symptoms are usually manifested, it is well known that a certain percentage, especially the older animals, affected with chronic lesions of swine fever, do not exhibit any distinct symptom of illness, they may appear to be in good health and keep in fair condition. Pigs so affected are a constant source of danger, as they are liable to suffer a recrudescence or exacerbation of the disease. Moreover, they are capable of spreading contagium by means of their dejecta. Breeding sows affected in this manner commonly abort, the act not being accompanied by more than slight indications of ill-health.

POST-MORTEM APPEARANCES.

Although the most conclusive evidence of the existence of swine fever is usually discovered on *post-mortem* examination, there is as great variety in the anatomical changes as in the symptoms.

In the per-acute form, only the general changes of septicæmia (or blood-poisoning) may be found without any distinctive local lesions. At other times the lesions approach those seen in the acute form.

In the acute form, the condition of the carcass may vary from prime to extreme emaciation, Discolouration of the skin may be evident or entirely absent. There may be a frothy discharge from the nose and evidence of a recent diarrhœa about the hind quarters. The eyes are sunken and a viscid discharge often adheres the eyelids together. The lips, gums, tongue, hard palate and back part of the throat occasionally show punctiform hæmorrhages, ulceration, or areas of necrosis.

On incising the abdominal wall, inter-muscular hæmorrhages may be seen, and the blood-vessels are found engorged with dark blood that does not form a firm coagulum. A quantity of fluid may be found in the abdominal cavity, usually of a straw colour, but may be turbid. The peritoneum may show petechiæ* or signs of congestion, or of having suffered from a fibrinous inflammation, which, in advanced cases, adheres the intestinal loops together.

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* Small capillary hæmorrhages somewhat resembling a flea-bite.

The mesenteric lymphatic glands are enlarged, dark, and hæmorrhagic in the per-acute and acute types of the disease, while in chronic cases they may undergo caseation.

Stomach and Intestines.—The lesions in connection with the digestive canal may be described as existing in three forms, *i.e.*, hæmorrhagic, the ulcerative, and the diphtheritic.

The hæmorrhagic type corresponds to the initial stage of ulceration, and is accepted as the earliest indication of the disease. The stomach, bowel, or other part affected is beset with numerous petechiæ, which may be scattered over the entire length of the alimentary tract and are usually marked in the large intestine where their appearance is very characteristic. Accompanying this condition, it is not uncommon to find the stomach, bowel, or both presenting a condition of intense congestion, with a sero-fibrinous exudate between the mucous and submucous coats.

The small capillary hæmorrhages which precede the ulceration are determined by the presence of the swine fever bacillus. The epithelium covering the petechiæ soon becomes separated and removed, leaving a minute surface of ulceration. In a few instances, the small ulcer heals, but usually, owing to the continued presence of the specific irritant—the bacillus of swine fever—the envolved tissues become necrosed and the process extends. The extension affects the mucous coat and underlying structures, in consequence of which a well-defined lesion is formed, known as a "swine fever ulcer." Although ulceration takes place in the initial stage of its production, the lesion is really a more or less circumscribed circular area of necrosis.* But when recovery is taking place, and the necrotic tissue becomes detached, the slough passing out with the dejecta, a true ulcer may, however, be found as a round depression in the mucous membrane.

Even in the same outbreak, there is a great variation in the number, size, shape, and colour of the so-called ulcers of swine fever. They vary in number from one to hundreds, and in size from that of a mere speck to that of a five-shilling piece. Occasionally a superficial ulceration envolves large areas of the mucous membrane. They may be circular, oval, or irregular, occurring widely separated or in rows or clusters. The large, irregular-shaped, areas of necrosis frequently met with are probably due to the coalescence of several smaller areas. The colour varies from lighter or deeper shades of yellow to grey, green, brown or black, the darker shades being due to the action of the bile pigments and colouring agents in the intestine. Its intensity depends on the age of the lesion.

It is very rarely that the ulceration leads to perforation of the wall of stomach or bowel, for, as the necrosis extends superficially or, as is often the case, into the deeper tissues, an increase takes place in the underlying fibrous tissue. The bowel wall may thus become greatly thickened throughout a considerable portion of its length, while its lumen is perceptibly narrowed. At other times this abnormal development of fibrous tissue is localised to that part of the wall immediately beneath the necrotic area, and, as it grows,

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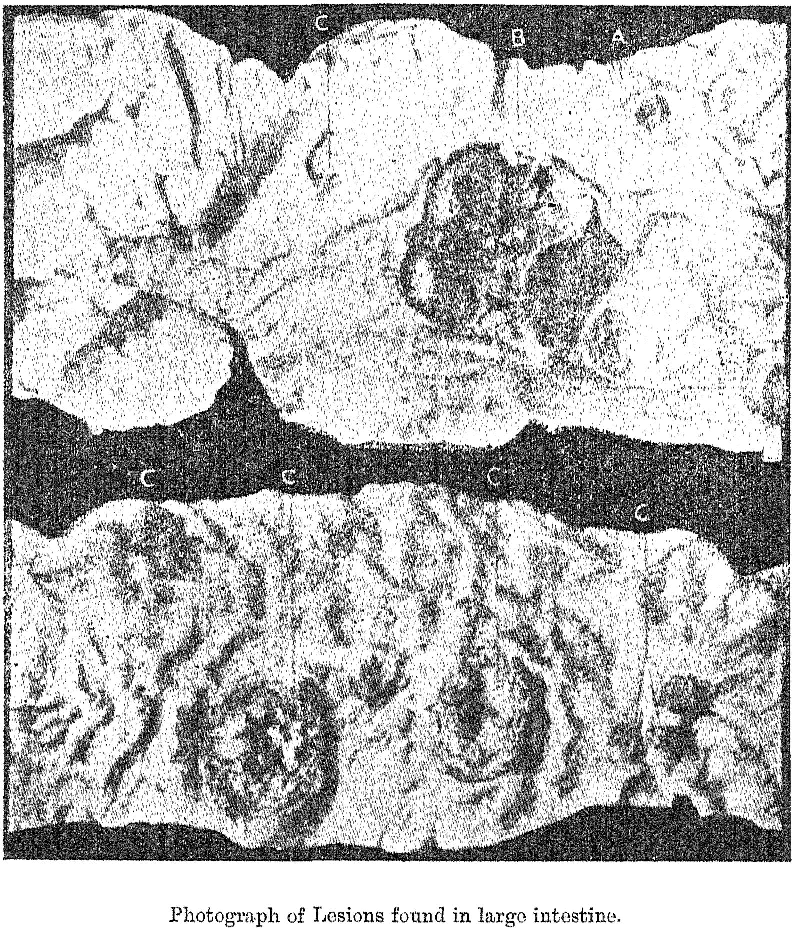
* Death of the envolved tissue.



Photograph of Lesions found in large intestine.

a Ilio-cæcal valve. *b* Necrotic mass about valve. *cc* Typical ulcers of Swine Fever in various stages of development.

it pushes the surface of the so-called ulcer until it protrudes well above the surrounding healthy tissue into the lumen of the bowel. These prominent circular lesions constitute what are commonly termed the "buttons of swine fever." In some very old cases of disease, they have a greater resemblance to the shape of a mushroom than to that of a button.

The diphtheritic form of the disease is characterised by the formation of a yellowish ashen grey exudate or deposit of fibrin on the inner surface of the stomach or intestine, accompanied by a necrosis of the immediate underlying tissue. The exudate may be sparing or abundant in amount. In the early stage it is so thin as to be almost entirely removed by washing, but in time, under ordinary circumstances, it becomes firmly adherent to the mucous surface, and presents a firm, tough, yellowish-grey, or in old cases, black surface, slightly raised above the surrounding normal tissue. The involved portion of the bowel may be very limited, or extend to a considerable length.

The above-described necrotic and diphtheritic changes are mainly found on the inner surface of the stomach and large intestine, particularly that of the latter, about the protuberance formed by the passing of the small intestine into the large bowel, and known as the *ilio-cœcal valve.* As a rule they are distinctly evident, but occasionally, and especially in cases that have run a rapid course, they have to be sought for diligently. The whole length of the alimentary tract must be opened up, washed, and carefully examined before one can be satisfied as to their absence.

The stomach or bowels are often found inflated with gas, and the contents of the large bowels offensive and pasty, adhering to the knife like putty.

The Lungs.—These organs may or may not be affected in the acute and chronic forms of the disease. When they are affected they show specific changes.

On opening the chest cavity, indications of pleurisy may be observed, and the lung found adherent to the chest wall or diaphragm, while the cavity may contain a more or less copious quantity of fluid, which may be clear and watery, or opaque and mixed with flakes of lymph.

The lungs may be enlarged, heavy and engorged with blood, while the lobules are mapped out by an inter-lobular effusion somewhat resembling in appearance that seen in contagious pleuro-pneumonia in cattle. The smaller tubes and the bronchi, as well as the windpipe, may contain a frothy, serous, or sanious liquid. The blood-vessels may contain dark blood clots.

The appearance of a multiple gangrenous pneumonia is held by some authorities to be characteristic of swine fever. Hepatised areas are found, particularly in the anterior lobes and at the roots of the lungs, which are solid to the feel and in colour vary from dark red to greyish red. On cutting through the thickness of a hepatised area it may be seen to have a slightly granular appearance, due to numerous small yellow or buff coloured caseous circumscribed foci or spots, which, in acute and chronic cases, often increase in size to that of a hen's egg. The yellow deposits are dead portions of the lung tissue.

The bronchial and mediastinal glands are usually greatly swollen, congested and moist, and have a mottled appearance.

Other Organs and Parts.—The pericardium usually contains a considerable quantity of fluid, which may be faintly yellow and watery, or opaque and blood-stained. In some epizootics a fibrinous pericarditis occurs, which occasionally leads to adhesion of the pericardium to the heart. The heart frequently shows punctiform hæmorrhages, particularly noticeable on the auricles and along the ventricular groove. On incising its cavities soft dark clots of blood are usually found, occasionally a white clot (anti-mortem) is present. Numerous spots of extravasated blood are seen under its lining membrane, especially about the elevated portions (musculi papillares) of the left heart.

The upper part of the windpipe—larynx, and particularly the epiglottis—is frequently the seat of well-defined punctiform hæmorrhages, and occasionally of well-marked typical ulceration, while the lining membrane of the æsophagus (or gullet) and of the trachea (or windpipe) often show numerous petechiæ. Sometimes the æsophagus is the seat of diphtheritic and necrotic lesions.

The liver and spleen are often dark and congested, and occasionally small necrotic areas are found present.

The kidneys are not uncommonly inflamed, and show numerous pinprick-like hæmorrhages, some of which may be seen through the kidney capsule.

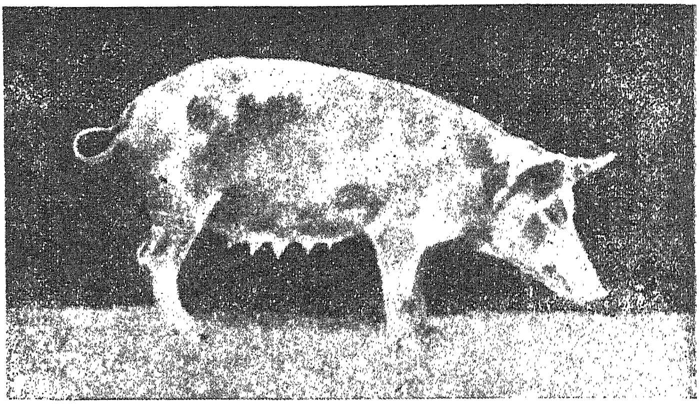
THE FATALITY OF THE DISEASE.

The fatality varies a good deal. Young store pigs from three to six months old, and fat pigs from six to twelve months old, as a rule, rapidly succumb. Pigs over one year old, although occasionally suffering an acute attack and dying rapidly, usually survive the fever, or become subjects of the chronic form. In herds where the per-acute and acute types predominate, the fatality usually ranges from 50 to 95 per cent. In general it is great where insanitary conditions prevail. As a rule, the chronic form is not so fatal.

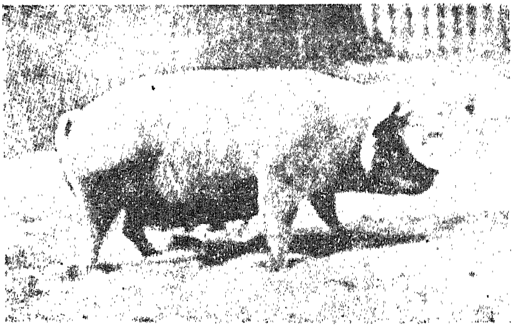
HOW THE DISEASE IS SPREAD.

The disease is spread by every means calculated to take part in the dissemination of the micro-organism.

The principal agents in this dissemination are diseased pigs, the origin of the majority of outbreaks being directly traceable to the introduction of pigs purchased at auction sales. In this connection pigs affected with the chronic form of the disease deserve great attention. There are many cases of obscure or chronic forms of the disease in which the morbid changes go on slowly for many weeks or months, and finally attain an excessive state of development without being attended by any of the symptoms usually regarded as diagnostic of swine fever. Some very important information in regard to this phrase of the disease was obtained by the Departmental Committee, appointed by the Board of Agriculture of Great Britain in 1895, in connection with the examination of swine which had been isolated for two months on infected premises. At the end of that time they were certified as being free from disease, and would, in the ordinary course, have been released. In several of these instances the pigs were slaughtered, and characteristic lesions of swine fever were detected on *post-mortem* examination. The Committee further found that swine placed in contact with affected pigs, or in sties that had been occupied by diseased



No. 6.—Photograph of Sow recovering from the chronic form of Swine Fever.



No. 7.—Photograph of a Sow that suffered a mild attack of Swine Fever and recovered.

It is pigs of the kind illustrated in No. 6 and No. 7 that are mainly instrumental in the spread of the disease.

animals, became affected with a similar type of slowly progressive disease, and, on *post-mortem* examination, that there existed a great disproportion between the well-advanced lesions in the digestive canal and the slight symptom of disease exhibited during life by the animal.

The introduction of sows and boars for breeding purposes is another common method by which swine fever is spread from one piggery to another, while pig-dealers, attendants, butchers and their appliances, together with their boots and clothing, are occasional agents in the spread of the disease.

Railway trucks, carts, crates, etc., used in the conveyance of diseased swine, may carry infection, while sty utensils are regarded as even more dangerous.

It is probable that rats and birds may carry the contagion from one sty to another, and, no doubt, dung and sweepings from infected premises may be spread broadcast by the wind. Flies must also be recognised as active agents in the spread of the disease to neighbouring sties.

MEASURES RECOMMENDED FOR THE PREVENTION AND SUPPRESSION OF THE DISEASE.

Introduction of new stock.—Before acquiring new animals they should be carefully examined, and enquiries made as to freedom from disease of the locality from which they are to be taken. Pigs intended to be introduced into the piggery should be isolated some distance from the herd and kept under observation for at least four weeks. If there is no history of their having been in contact with the disease, and they manifest no signs of sickness during the period they are isolated, they might be admitted into the piggery.

Care with visiting pigs.—Under no circumstances should sows or boars visiting for breeding purposes be admitted into the piggeries. Special sties in an isolated position should be erected for their use. Swine that have been in contact with visiting pigs should be treated as new stock before being permitted to return to the piggery.

Immediate isolation of sick pigs.—In connection with all large piggeries it is advisable to establish a hospital sty some distance from where the herd is kept, to which any pig showing signs of ill-health should be removed and kept under observation.

Slaughter of affected pigs.—All pigs that are suffering, or suspected of having suffered, from swine fever should be immediately slaughtered and totally destroyed by fire. All blood and discharges that come from them should also be burnt, and lime scattered over the ground where they have fallen.

Treatment of in-contact pigs.—As pigs that have been in contact with affected animals are the chief agents in propogating infection, it is always advisable to send such animals to the slaughtering houses as soon as practicable. All carcases that are sound will be passed by the inspector, and the pork sold for human consumption. Should the in-contact pigs be retained, the majority will probably, in the course of a week or so, develop the disease, infection spread to other sties, and the whole of the herd, in course of time, become affected.

Disinfection of infected Sties, yards, etc.—Sties in which pigs have developed the disease should be subjected to most thorough cleaning and disinfection. All dirt and refuse must be removed and destroyed by fire, the floors and gutterings repaired and made impervious, the troughs treated with boiling water, and the whole of the buildings, floors, and fences painted with freshly made lime-wash. It is recommended that the lime-wash be made in the proportion of half-a-pound of fresh unslaked lime to one gallon of water, to which is added a cupful of crude carbolic acid. The buildings should be allowed to remain idle for at least three months, and be again lime-washed before they are re-stocked. Where they are old and dilapidated, the advisability of burning them should be seriously considered. Utensils such as brooms, shovels, rakes, etc., used in affected sties, should be thoroughly cleaned and disinfected with boiling water containing carbolic acid.

The yards or runs in which affected pigs have been enclosed should be top-dressed with lime, and then dug or ploughed up, and the fencing treated with lime-wash.

That infection may be spread by the clothes and boots becoming soiled indicates that the attendants should be compelled to change these articles after entering an affected sty, and wash them in water containing carbolic acid.

General sanitation.—All sties should be swept out and the yard raked over at least once daily, and the filth and refuse at once done away with. Wooden feeding troughs should be replaced by others made of cement or metal, securely erected on impervious platforms. Drainage should receive attention, and a good supply of water for cleansing and drinking purposes required. The coppers or vats used for boiling food should be kept clean, while bones and rubbish should not be allowed to accumulate. All buildings and fences of the piggery should be periodically, and at least once a fortnight treated with newly made lime-wash*

Management of herd.—Every owner should endeavour by careful management to breed strong and healthy pigs. In feeding them it is desirable to boil all kitchen refuse. Pigs do best on a mixed diet.

REMARKS.

The above article is written for the guidance of inspectors of stock and meat, and also for the information of those who breed and feed pigs. Technical terms and descriptions have, therefore, been avoided, wherever practicable. It has assumed greater proportions than was anticipated when commenced but the disease is of so peculiar a nature that any brief description necessarily becomes more or less incomplete. In its compilation I have supplemented my personal observations by reference to many standard English publications, including Freidberger and Frohner's Veterinary Pathology, the Journal of Comparative Anatomy and Therapeutics, vols. IX and XV, Bowhill's Bacteriology, and the report of the Agriculture Department of Great Britain, 1895.

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* The spray pump or "Spramotor," will be found of great service in distributing the lime-wash.

In conclusion I trust this contribution to the *Agricultural Gazette* will be of service to those interested in the pig industry in their efforts to eradicate the most dangerous of all porcine diseases that has yet been introduced into this State. It must, however, be remembered that the preventive measures recommended are to be promptly, energetically, and thoroughly enforced to be fully effective.

BEE NOTES.

By J. Sutton.

The following report has been made by the Bee Expert, Mr. J. Sutton, to the Acting Director of Agriculture:—I have the honour to report that I have just completed a very successful tour of inspection, and given instructions and lectures at the following districts or centres, and considering the winter season has been one of severity, so far as bee-keeping is concerned, I am glad to say I found much less disorder and pests than I expected. At Albany and district I examined 141 colonies, a few only with moth:—

King River and District ...	29 colonies, in good condition
Kalgan River and District ...	30 colonies do. do.
Denmark and District ...	63 colonies, in fair order
Marbellup	22 colonies, fair but moth in evidence
Grassmere and Torbay Junction	144 colonies, fairly strong stocks
Mount Barker	20 colonies, in very good order
Katanning	28 colonies, some of the moth were very strong
Wagin	79 colonies, each in very good condition

At Albany I delivered two lectures in the Town Hall to fairly good and attentive audiences; also at Denmark, Torbay, Mount Barker, and Wagin, and found the lantern views were much appreciated and helpful.

At Albany, Denmark, and Wagin I gave practical demonstrations in the handling of bees, which were of much interest, some of the audience did not require reminding that bees had a pointed objection to some who were a little venturesome.

I was very pleased to notice the instructions I had given on my previous visit were bearing fruit, and the owners were alive to the fact that a little attention at the proper time made the work of handling the bees and removing stores not so terrible a job after all.

A few still adhere to the old box hives, but in most cases steps are being taken to replace these with the frame hives. Out of the lot of 556 as above, only 197 are in the old boxes. A few have adopted the Heddon system of hive, but the Langstroth size is giving a much better return.

Both in the Albany district and at Wagin steps are being taken to bring the beekeepers into line in the shape of an association. This will be a great help to your inspector when visiting these centres, as I learned too late there were several who were anxious to have their stocks put in order, but time would not permit my giving them attention.

We had some stormy weather both at Grassmere and Torbay, which to some extent was unfavourable to handling bees. At Mount Barker while in the operating we had a storm of hail that made our visit at the apiary and removing stores one long to be remembered. Hail and honey were much in evidence.

I have every reason to believe that some will, during the coming season, have profitable returns in honey that hitherto have not done any extracting.

While those already interested in Bee Culture in these districts are making satisfactory progress, and they are hopeful as to the future, I am pleased to note others are becoming interested. Several who are already fruit producers, and are increasing their areas in that line are contemplating adding bees to aid in polonising their fruit, which is a step in the right direction.

While perhaps not directly in my line, I may be permitted to add that clearing and fallowing in some of these districts are much in evidence, and considerable cultivation has been recently added to the districts. Some South of Katanning have been much damaged by recent heavy rains, and the long severe winter, but considering all the conditions, most crops are looking well, and will give good returns, while those North of Wagin look exceedingly promising.

POULTRY NOTES.

By Frank H. Robertson.

Wyandottes.

The Wyandotte is one of the comparatively new breeds of poultry, produced by the Americans some 20 years ago. The first variety was the Silver Laced, their origin is somewhat obscure, but no doubt light Brahmas and Hamburghs were largely used in their manufacture. Since their advent they have been steadily increasing in popularity, and by reason of their good all-round qualities have become firmly established favourites with poultry-keepers all the world over. They combine good table qualities with a plentiful egg supply, and in this latter respect they are running level with the Mediterranean breeds in the laying competitions. Wyandottes are hardy and easy to rear, and of very attractive appearance. A well-laced specimen is very pretty, and when one sees a flock of these beautiful birds on a good grass run, the combination of black and white, or gold and black plumage, yellow legs, and bright-red head-points presents a picture that even the least interested person in poultry cannot fail to admire.

The following is the English standard and points, by reading which anyone can learn what a good specimen should be:—

General Characteristics of Cock.

Head and Neck.—Head: short and broad. Comb: rose, firm, and even on head; full of fine work; low and square at front, tapering towards the spike, which should follow the curve of the neck. Face: smooth and fine in texture. Ear-lobes and wattles: medium length; fine in texture. Neck: medium length, well-arched, with full hackle.

Body.—Breast: full and round, heel-bone straight. Back: broad and short. Saddle: full and broad, rising with concave sweep to tail. Wings: medium size, nicely folded to the side. Tail: well developed, spread at base; the true tail feathers carried rather upright; sickles of medium length.

Legs and Feet.—Thighs: of medium length, well covered with soft, webless feathers. Fluff: full and abundant. Shanks: medium length; strong but fine in bone. Toes: four in number; straight and well spread.

General Shape and Carriage.—Graceful and well balanced, resembling a Brahma.

Size and Weight.—Rather large. Matured cockerels about 7 lbs.; adult cocks about 8½ lbs.

General Characteristics of Hen.

Head, Comb, Face.—Ear-lobes and wattles as in the cock, but the appendages smaller.

Neck.—Medium length, with short, full hackle.

Body.—To correspond with that of cock. Back: short, and wide at shoulder.

Tail.—Well spread at base.

Legs and Feet.—As in cock.

General Shape and Carriage.—To correspond with the cock.

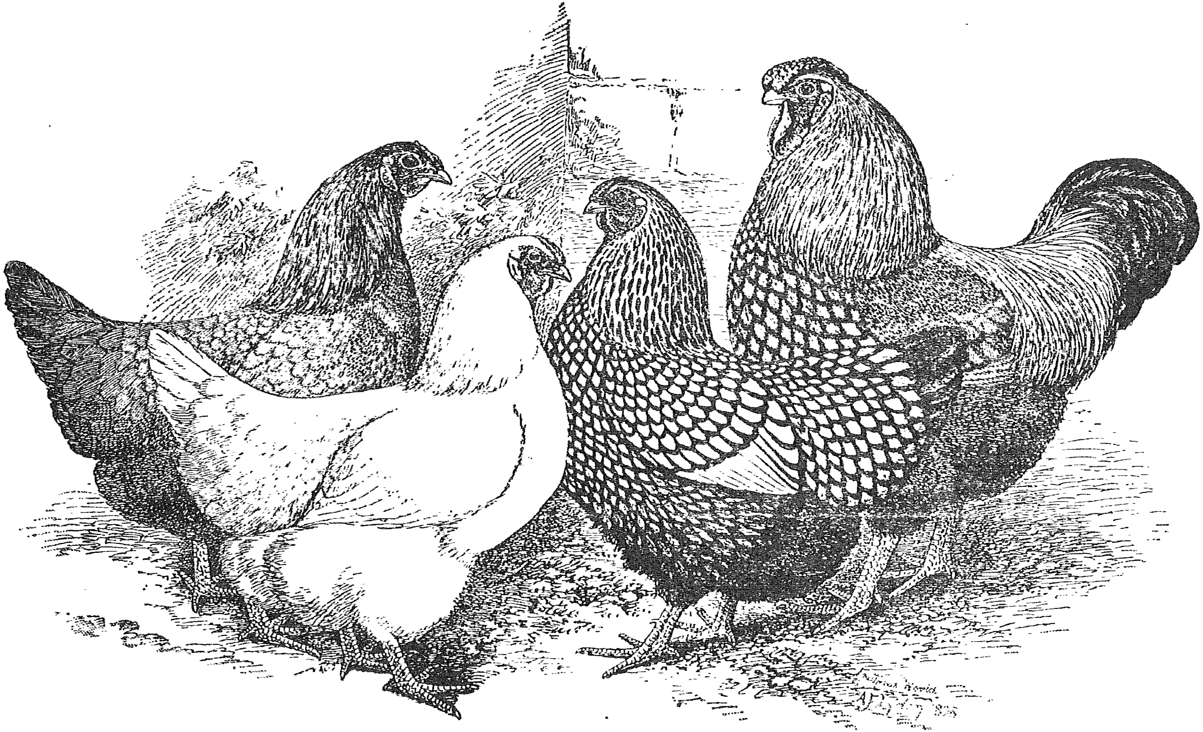
Size and Weight.—Pullets, 6lbs.; hens, 7lbs.

Colour of Silver Wyandottes.

In both Sexes.—Beak: horn colour, shading into or tipped with yellow. Eye: bright bay. Comb, face, ear-lobes, and wattles bright red. Shanks and feet: bright yellow.

In the Cock.—Head: silvery white. Neck: silvery white, with clear black stripe through centre of each feather; free from ticks. Saddle: hackles to match the neck. Back: silvery white, free from yellow or straw colour. Shoulder-tip: white, laced with black. Wing-bow: silvery white. Wing-coverts: evenly laced, forming (at least) two well-defined bars. Secondaries: black on inner, and wide white stripe on outer web; the edge laced with black. Primaries or flights: black on inner web, and broadly laced white on outer edge. Breast and ander-parts: the web white, with well-defined jet-black lacing, free from double or white outer lacing; the lacing regular from throat to back of thighs, showing green lustre. Under-colour: dark slate. Tail: true tail feathers, sickles, and coverts black, showing green lustre. Thighs and fluff: black or dark slate, powdered with dark grey, with clear lacing round hocks and outer side of thighs.

In the Hen.—Head: silvery white. Neck: silvery white, with clear black stripe through centre of each feather; free from ticks. Breast and back: under-colour, dark slate; web white, with regular, well-defined, jet-black lacing, free from double or outer lacing, and showing green lustre. Wings: same as back on the broad portion. Secondaries and primaries: as in the cock. Tail: black, showing green lustre; the coverts black, with a white centre to each feather. Thighs and fluff: black or dark slate, powdered with dark grey. (N.B.—Regularity of lacing and quality of colour in all cases to count above any particular breadth of lacing.) Colour and markings of Golden Wyandottes are in general similar to the Silver, with the substitution of rich golden bay for white in ground colour. Brightness and equality of ground colour and regularity of lacing throughout to be of first importance.



Mr. J. G. Morten's Wyandottes,

Buff Pullet—never exhibited. White Hen—First, Dronfield. Silver Hen, "Queenie"—First, Birmingham. Gold Cock—First and special, York.

Colour of White Wyandottes.

In Both Sexes.—Beak: bright yellow. Eye: bright bay. Comb, face, ear-lobes, and wattles: bright red. Plumage: pure white throughout; straw colour to be avoided. Legs and feet: bright yellow.

Value of Points in Wyandottes.

(Gold or Silver Cock or Hen.)

	Deduct up to
Defects in comb	8
Defects in head	5
Defects in ear-lobes and wattles	6
Defects in neck	8
Defects in breast	14
Defects in back	14
Defects in tail	7
Defects in wings	12
Defects in fluff	6
Defects in legs	6
Want of size and condition	14
A perfect bird to count	100

Serious defects, for which birds should be passed. Any feather on shanks or toes; permanent white or yellow in ear-lobes, covering more than one-third of their surface; combs other than rose, or falling over on one side, or so large as to obstruct the sight; wry tails; deformed beaks; crooked backs; shanks other than yellow in colour (except adult cocks and hens, which may shade to light straw colour); feathers other than white in whites; white in tail, or any conspicuous spotting or peppering on ground of the feathers, in Silvers or Golds; black in tail, or any excess of blue or grey in lacing of Buff Laced. Fresh varieties are continually being produced. In addition to the above there are Buff, Buff Laced, Partridge, and Silver Pencilled.

From the above it will be seen that the most important points are good lacing, top colour, and type. It is very difficult to get first-class lacing. Each feather should be clearly and distinctly marked all round with black. Many hens good on breast fail as they approach the thighs, and on the back towards the tail get indistinct and mossy looking in the markings; and one will often find a bird good in plumage but bad in shape, the failing being legginess and want of fullness in the breast. The Wyandotte, to be a good specimen, should have a cobby appearance, and plump looking, for be it remembered, this is a general purpose breed—that is, good either as an egg producer, and good for the table. The Silver and the Gold are the two most popular varieties in Western Australia. The Whites are fairly numerous, and are gaining fast in public estimation. They were originated as sports from the Silvers, and it is still by no means unusual to get white chicks from the best Silver stock. Other faults that Wyandottes are subject to is the throwing of single-comb birds, and some with feathers on the legs.

As showing the unreliability of some strains, the writer knows of a setting of 10 eggs which produced two whites, one with single comb, one with feathered legs, one very dark in plumage showing no lacing and much white in lobes, one good show specimen, and two fairly good specimens.

Taken as a good all-round breed, there is none to beat the Wyandotte. Their egg is certainly smaller than those laid by the Mediterranean breeds, but as size of egg does not count to any appreciable extent when selling in the auction rooms, this failing is not a serious one. They are good foragers, yet not flighty, only moderate eaters, and splendid setters and mothers, which is a great advantage.

I find during my travels round the country that many farmers are very much hampered in their breeding operations owing to the want of setting hens, but if some Wyandottes are also kept this difficulty is got over. In fact, every poultry keeper should breed his own brooders. It will be found that hens which lay brown eggs go broody. The breeder of pure fowls laying white eggs need not have his arrangements interfered with by the introduction of Orpingtons, Langshans, Rocks, or Wyandottes, as their eggs are easily distinguishable, and his pure Leghorn or Minorca breeding can be carried on just the same by only setting the white eggs. I have gone fully into a detailed description of the fancy points of this breed; but after all such is not of vital importance to the farmer who looks to a plentiful egg yield as his chief source of profit; therefore, in selecting the stock birds to breed from it is not advisable to throw out a first-rate layer merely because it has some fault such as badly-laced plumage, or too much white in lobe, etc., etc. The chief points to be looked for are robustness of constitution and good laying qualities.

It is a well-known fact that fanciers have done a tremendous amount of harm to many kinds of poultry by paying too much attention to breeding for show points to the detriment of the utility qualities. At the same time, were it not for fanciers there would be no pure breeds at all, because the ordinary farmer would certainly not bother his head about keeping pure breeds to the fore. Therefore, on the whole, the fancier has been of immense service in furthering the ends of successful poultry culture, and as an example there stands the Wyandotte, which at the present time is in the foremost rank as a good all-round fowl, that has not as yet felt the deteriorating effects produced by too much in-breeding.

Persons interested, or in want of information on poultry, are again reminded that the poultry expert is willing to call at any place desired and give lectures which are illustrated with lantern views. He can also personally call on farmers and explain how to successfully raise poultry suitable to their particular district and local surroundings.

AGRICULTURAL LECTURES.

By Percy G. Wicken.

THIRTY-FIFTH LECTURE.

SHEEP.

Dentrition of Sheep.—The teeth of the sheep are the same in number as those of the ox. The full-grown sheep has 32 teeth. There are eight incisor or cutting teeth in the forepart of the lower jaw, and six molars above and below on either side of the jaw. Youatt, the great authority on sheep, says:—"A newly dropped lamb is sometimes without incisor teeth and sometimes it has two, but if not they make their appearance during the first week, the others come on rapidly, and by the time they are a month old they have the eighth milk teeth. They continue to grow with the growth of the lamb until it is about fourteen or sixteen months old. At this age the two central teeth are shed, and the permanent broad teeth appear and attain their full growth when the sheep is two years old. Between one and three-quarters and two years old the next incisors are shed, and when the sheep is a little over two years old the four central teeth are fully grown. At three years old it has six permanent teeth, and at four years old the teeth are perfectly developed, and it is called an eight-tooth or a full-mouthed sheep. After the permanent teeth have all appeared there is very little criterion as to the age of the sheep. In examining a flock of sheep there will often be a considerable difference in the teeth of the hoggets or one-shears, in some measure to be accounted for by the difference in the time of lambing and likewise by the general health and vigour of the animal. There will also be a difference in different flocks, attributable to the good or bad keep which they have had. Sheep that have been fed on rich land and good pastures will take the lead of those kept on poor land, and renew their teeth sooner. Irregularities occasionally occur in teething which cannot be accounted for.

At six years old the incisors commence to decrease in depth and lose their sharp appearance, and at seven and eight years old they become open and commence to wear down very low and fall out, but this again depends largely on the pasture. After this the sheep are broken-mouthed and begin to decline and are best disposed of, as they soon lose condition; the wool declines in quality and they become unprofitable. The natural age of the sheep is about ten years, although instances are recorded of much greater ages being reached. The back teeth of the sheep, the grinders or molars, are well adapted for chewing up the roughest herbage. As will be seen from the above, the age of the sheep is always stated up to five years old by the number of incisor teeth they have, thus the two-tooth is fourteen to eighteen months old, the four-tooth two years old, six-tooth three years old, and eight-tooth four years old, when they are styled full-mouthed. After this age they become broken-mouthed or aged.

Breeding.—The ewe should not be used for breeding purposes until she is at least four-toothed. It is a great mistake to commence breeding earlier than this, as it weakens the ewes and they never do well afterwards. The period of gestation in the ewe is 20 weeks. Five or six weeks is long enough to allow the rams to run with the ewes, and if removed after this period the lambs will be of an even age. When the lambs are about two months old, they should be brought in during fine, bright weather, and yarded up so that they can be ear-marked, branded, casterated, and their tails docked. These operations are generally all performed at the one time, and where care is used the loses do not amount to more than one per cent.

Branding.—Pitch or tar should never be used for branding sheep, as it is very difficult to scour out of the fleece, and deteriorates the value of the wool. A good mixture for use in branding in the Australian States is lampblack and boiled oil, mixed in the proportion of $\frac{3}{4}$ to 1lb. of lampblack to 1lb. boiled oil. Tallow and lampblack, if mixed together until the consistency of paint, is also a good mixture, but must be kept warm while using. If red brands are required, venetian red is substituted for lampblack, and if blue, ultramarine, and if green, a mixture of ultramarine and yellow is used. The tallow and lampblack is probably the cheapest mixture, and will wash out of the wool easiest. The mixture may be kept hot by the use of an ordinary glue pot containing hot water.

An implement for branding sheep can now be obtained in which the material for branding is contained in the handle, and simply requires pressing on the back of the sheep. Fire-branding is not much in use at the present time, but when practised consists of branding certain marks on the nose or face of the animal with a hot iron. This often disfigures the animal, and is not a good method of branding.

Ear-marking.—Ear-marking consists of punching a hole or mark on the ear of the sheep, the same as the railway authorities do with a passenger's ticket. Punches are now made for this purpose, by which any brand can now be cut out. Formerly this work was always done with a knife. The punch will make a much better and cleaner job than a knife. A system of ear-marking can also be carried out by which the age of the sheep can be told at a glance. All breeders of stock should have their own registered brand and ear marks, which they alone have the right to use. These brands are registered through the Registrar General's Department, who ascertains that a brand does not infringe on any other brand before granting it to the applicant. The cutting off the ear of a sheep is punishable by a fine, as this would destroy the ear mark.

Cross-breeding refers to crossing between different breeds of sheep, and not between the same family. The ram exercises much more influence over the progeny than the ewe. For instance, the products of a cross between a Lincoln ram and a merino ewe would be quite different from that of a merino ram and Lincoln ewe.

Cross-breeding in sheep should never be carried beyond the first cross, and a cross-bred ram should never be used for stud purposes.

The Down breeds of sheep are especially valuable for raising early lambs for market.

The question of in-and-in breeding is one that has given rise to much discussion, and as a rule is only practised when it is desired to propagate some especially good quality in a stud flock, and should not be carried on to any extent, as it tends to weaken the animals, and makes them more prone to disease.

The keeping of a few breeding ewes upon a farm ought to be considered an essential point by every farmer, and if a few good ewes were purchased every year, the wool and the yearly increase of lambs would always prove a source of profit, and there is nearly always sufficient feed upon a farm to keep a small number of sheep.

WOOL.—The time of the year at which to commence shearing must be largely guided by the season. Starting at North Queensland and continuing down to New Zealand, shearing may be said to be going on all the year round., Shearing should be performed before the weather starts to get warm, and particular attention must be paid to keep ahead of the grass seeds, which otherwise get caught in the wool and greatly deteriorates its value. Shearing should not be carried out too soon after heavy rain, but sufficient time should be allowed to allow the fleece to dry before being shorn. A mistake is often made by shearing too early in the season, as if a cold wet spell takes place the sheep are not in a position to stand it, and are likely to die from exposure.

In shearing the fleece all second cuts should be avoided. It is better to lose the small piece of wool than to make second cuts, which detract from the value of the wool. The fleece must not be broken to pieces during shearing, as it cannot then be rolled up properly, If any cuts are made in the sheep while shearing, Stockholm tar is the best material to use. It is just rubbed over the cut; it heals the wound and also keeps off the flies.

On being removed from the shearing floor the fleece should be kept well together and spread out on the wool table, face (cut end) downwards. The belly part is then removed and thrown into separate heaps along with the skirtings, which consist of the lower parts of the legs and thighs.

In rolling the fleece the neck and sides are turned in, the fleece well rolled up, and passed to the wool-sorter, and then placed in bins ready for bailing up. Roughly speaking, about 100 ordinary-size fleeces go to a bale of 4cwt., but this largely depends on the size and weight of the fleeces, and varies considerably. The wool is generally sorted into first and second combing and first and second clothing.

The term *combing* is a distinctive term, applied to the length and soundness of the staple as being suitable for the combing process of manufacturing. Combing wool should be 2in. or more in length.

The term *clothing* is an equally distinctive term, meaning wool of the shorter growth, and in many instances of finer character and quality, which the manufacturers put through a carding machine, it being too short or weak in the staple for combing.

There are a large number of other terms used in the wool trade, but they need not be mentioned in these lectures.

The accompanying illustration shows the quality of the wool on various parts of the sheep:—

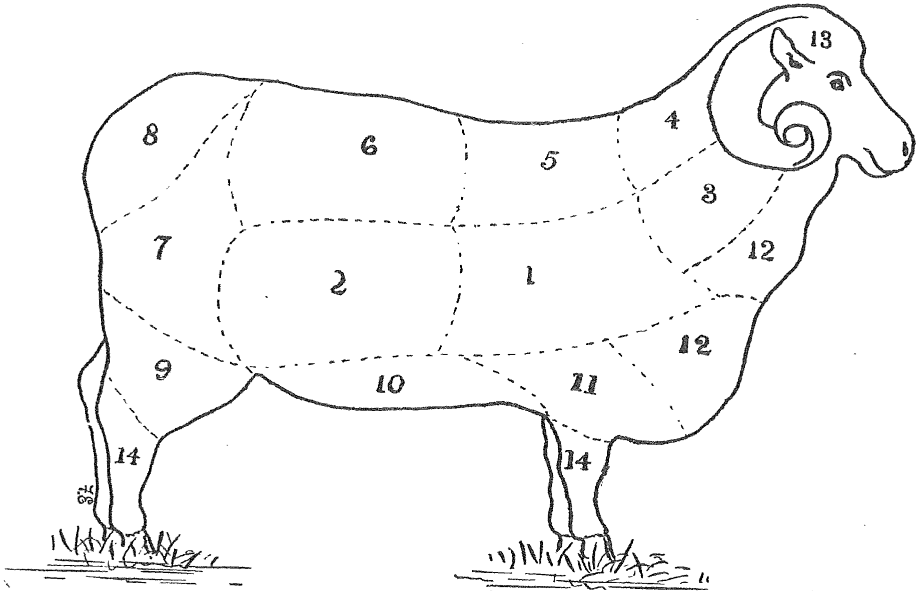
1 and 2.—The finest. longest, and strongest wool.
3 and 12.—Short but close.
4.—Rather longer and a shade lower than 3.
5 and 6.—Slightly not so close and apt to become weak in fibre.
8.—Lower grade still and termed the "britch."
7.—Good length but slightly lower in quality than 1 and 2.
9.—Shorter and not so lustrous when compared with better parts.
10.—Short and generally poor in quality.
11.—Shorter than 12.
13.—The cap dry and harsh.
14.—Fribby and of little value.
Nos. 9, 10, 11, 13, and 14 constitute the skirt.

THIRTY-SIXTH LECTURE.

PIGS.

The wild hogs from which the domestic breeds of pigs have taken their rise are natives of Europe, Asia, and Africa, and are to be found wherever the climate is mild enough to allow of sufficient feed for sustenance in winter. In America, Australia, and the Polynesian Islands pigs were unknown until introduced. In England the wild pigs have been extinct for a long time past, but in parts of Europe they may still be found in diminishing numbers. In parts of Eastern Australia, especially in the mountain ranges, wild pigs are to be found in considerable numbers, but the animals have wandered away from some farm or other at a earlier period and gone back to a wild state.

The fecundity of the pig is one of its most remarkable characteristics. Their natural term of life extends to 15 or 20 years, and



Quality of wool on various parts of Sheep

they are capable of reproducing their species at nine months old. They produce very large litters. The celebrated naturalist, "Vauban," has made a calculation of the probable production of an ordinary sow during the space of 10 years. He has not included male animals in his estimate. The result shows that the product of a single sow in 11 years, which is equal to 11 generations, will be 6,434,838, or, allowing for accidents and disease, in round numbers six million. "Youatt," in his works on the pig, also gives the same illustration with regard to their powers of reproduction.

THE BERKSHIRE.—This fine breed of pigs have been bred in county Berkshire, England, and in the adjacent counties from a very early period. The Berkshire was originally of a sandy or buff colour, and spotted with black, and a very inferior animal. The improvement commenced during the eighteenth century, and was due to the importation of a Siamese boar, who was mated to the Berkshire sows. The Siamese pigs were of a jet black colour, and quick to mature. After using this boar for a period the progeny were mated together and gradually improved, the result being the Berkshire of the present day.

The characteristics of the Improved Berkshire are: colour, black, white on feet, face, tip of tail, and occasional splashes of white behind the shoulder. While a small spot of white on other portions of the body does not condemn the animal as being impure, still it is not to be encouraged, as a uniform black colour is desirable, and an animal with white markings other than those mentioned should not be used for stud purposes. The face should be short, fine, and well dished, broad between the eyes, ears small and thin, jowl full, neck short and thick, shoulders short from neck, back broad and straight, hams thick, round, and deep; tail fine and small, bone fine and compact, offal very light, hair fine and soft, skin pliable. A well-bred Berkshire will attain weights of 450lbs. to 500lbs. at 18 months old if well fed. To show the rapid rate of growth of these animals, the following tests at an American experimental station are instructive. The weights of the young animals are as follows:—At farrowing, 5lbs.; at 80 days, 88lbs.; at 100 days, 123lbs.; at 121 days, 160lbs.; at 143 days, 205lbs.

THE ESSEX originated in the South of England, and are entirely black; they are of medium size, and are largely used for crossing with coarser breeds to improve their fattening qualities. The best specimens may be known as being entirely black in colour, face short and dishing, ears small and soft and standing fairly erect, bone fine, hair generally rather thin. The fattening qualities are very superior. Although dark-skinned, like most other black pigs, when dressed the skin is beautifully white and clean. The Essex are not noted for large litters, and are principally used for grading up inferior herds.

THE LARGE BLACK PIG.—Although generally regarded as a new breed of pigs, it is really an old breed which has lately come to the front. For many years it has been bred in the southern counties of

England in large numbers. Messrs. Richardson Bros., of Wooroloo, have recently imported some fine specimens of this breed. It is a splendid grazier, very hardy, a rapid grower, and a good doer. It has great length of body, deep sides, long broad loin, and nicely shaped hams, and will attain to very great weights. It has large lopped ears fringed with hairs and a rather long nose, which somewhat detract from its appearance; the head is comparatively small; the colour is pure black. A Large Black Pig Society was formed in England in 1898, and has done much to bring this breed to the front at all the principal shows held during the last few years.

THE POLAND CHINA PIG is an American breed of swine. The breed originated in the Miami Valley of Ohio. The first attempts were commenced about half a century ago. They were first called "Magie," from one of the pioneer breeders, then "Butter County," and several other names, which led to confusion. In 1872 the National Swine Breeders' Association of America decided upon the name "Poland China," by which they have ever since been known. The breed is a combination of various breeds which were brought together, and, in the rich valley of the Miami, where there are rich and luxuriant crops and abundance of water and skilful farmers, various crosses were made until a well-established type was fixed, and this breed have spread throughout America, as well as to other parts of the world. In America they far outnumber any other breed of swine. They are good graziers, thriving and making good progress on grass. They fatten rapidly on good food, attaining a good weight at an early age. Their pork, when raised on grass and finished up with corn, is well marbled or streaked with fat and lean. In the small proportion of waste or offal, these hogs, by tests in Chicago, have been shown to be unsurpassed by any other breed. The best specimens of the breed have great length; short legs; broad, straight backs and deep sides; very broad, full, square hams and shoulders; dropping ears; medium short heads, wide between the eyes. They are of spotted or dark colour; are hardy, vigorous, and prolific, and, when fat, are simply models. Their early maturing qualities and evenness of weight are excellent, and the following list of the weights of a number of these hogs sent to the Chicago packers in one season by Mr. David Magie, the founder of the breed, will give some idea of their qualities. The age of the hogs ranged from 18 to 21 months old:—

One lot of	63	averaged,	dressed	444
,,	40	,,	,, ...	417
,,	80	,,	,, ...	433
,,	60	,,	,, ...	400
,,	72	,,	,, ...	413
,,	100	,,	,, ...	408
,,	43	,,	,, ...	467
,,	35	,,	,, ...	451
,,	120	,,	,, ...	458

Other instances of heavier weights could be given, but this is the average of a large number.

WHITE PIGS.—The principal white breed is the Yorkshire. These are divided, again, into three classes—the large, middle, and small Yorkshire. The objection to the white pigs is that they are liable to sun-scald in the hot weather.

LARGE YORKSHIRE.—By most breeders this breed is known as the "large white." There are not many specimens in this State. It is a favourite breed in Europe, and the French and German import a large number from England. A black or blue spot is not considered a defect so long as white hair grows over the patch. They mature early, and attain to great weights, reaching as high as 400lbs. at 16 months old.

MIDDLE YORKSHIRE.—This is a favourite breed with many. They are usually of good length, and a favourite for baconers, and also used for crossing with the Berkshire. They are small in bone, and have a large proportion of flesh, yielding when dressed 90 per cent. of their live weight.

SMALL YORKSHIRE.—This is a small breed which have become great favourites. They are always ready to fatten, and give a very small proportion of bone and offal. They are more suitable for porkers than baconers. They are said to produce a pound of pork at a lower cost for feed than any other breed. The skin is clean and healthy, with fine curly hair, and they are of very cleanly habits. The head is small, with a short nose and well-dished face; the ears small, thin, and erect. They attain weights up to 300lbs. at 12 months old.

These breeds—small, medium, and large Yorkshire—verge very much one into the other, and it is often hard to tell to which variety they belong; they are sometimes exhibited in all classes as they become older and larger.

THE CHESHIRE is an American breed of white pigs. They are pure white in colour, with very little hair. The snout is long, but slender and fine. The shoulders are wide, and the hams full. There are none or very few of this breed in the Australian States. They are principally bred in the State of Pennsylvania, in U.S.A.

TAMWORTH is a comparative new breed of pigs to these States, although it has been known in the midland counties of England for many years. It derives its name from the town of Tamworth, situated on the borders of Staffordshire and Warwickshire, in which counties the breed is principally found. Early in the last century the colour which was considered best was a very dark red, and it is only of late years that the light brown colour has become fashionable. Originally it was a very large, active, lean pig, with a long snout, and, although now much improved, has the same shape of head and general form. The bright red colour is said to be obtained by crossing with the Indian jungle boar, which is similar in appearance to the Tamworth, and is also responsible for the great vigour and stamina of the breed. The improved Tamworth is especially noted for the great proportion of lean bacon which it produces. The breed is more hardy and quick growing than the old breeds; the frame is massive and the body long and deep, and has of late years gained great popularity. They are particularly useful for crossing with the Berkshire to produce a good bacon pig; and the large bacon factories in the Eastern States prefer this cross to all others, as the body is long and gives a good long side of bacon; the meat is streaky and meets the requirements of the trade. The Tamworth is said to be rather slow in fattening, although the improved breed is much better in this respect, but if put to fatten too soon they will continue to grow more than fatten. They are very prolific breeders, and generally have two litters each year. Another advantage claimed for them is that they are better able to get their own living than any other breed, being good foragers, and having a long snout for digging up roots, etc. There are a fair number of Tamworths in this State. Mr. F. Alcock, at Maddington, has a good number. The Department of Agriculture imported several of this breed two years ago, and they were all sold to settlers in different parts of the State.

THIRTY-SEVENTH LECTURE.

PIGS.

THE TEETH OF THE PIG.—The domestic pig, when full-grown, say, at two years of age, has 44 teeth, divided as follows:—12 incisors, six upper and six lower; four wolf teeth, one upper and one lower on each side; four canine teeth, one upper and one lower on each side; and 24 molars, six upper and six lower on each side.

The age of the pig can be determined up to two years of age by an examination of the teeth, but as this cannot at all times be very easily accomplished, it is not of much consequence.

THE FORM OF A GOOD PIG OF ANY BREED.—The aim of all breeders of any animals designed for meat, whether they are bullocks, sheep, or pigs, is to produce a body filling as nearly as possible the four squares of a rectangle. In proportion to the size, an animal of this shape contains the greatest weight. Another advantage of the square form is that it gives a much greater proportion of the most valuable parts of the pig, namely, the ham and shoulders. Many people object to the improved breeds because they are too short, but they appear short because they are so broad. A minimum of bone and offal, and a maximum of flesh are the desirable points of a good, profitable pig. The weight of the stomach in proportion to each 100lb. of live weight is, in the ox 3lb., sheep 3½lb., fat pig 0·66lb. This shows that the stomach of an ox or sheep in proportion to live weight, is about five times as great as that of the pig. But, although the stomach is small, the intestines are capacious, and this enables the pig to eat, digest, and assimilate more nutriment in a given time, in proportion to his size, than any other of our domestic animals.

MANAGEMENT OF PIGS.—In our temperate and congenial climate the old system of keeping pigs in small, dirty sties, should be discontinued. The pig is not necessarily a dirty animal, and, if given proper facilities, will keep herself clean. Sties are only really necessary during the time that the sow has a litter; this is necessary, as pigs are often given to cramp and rheumatism at time of parturition, and while suckling their young. At all other times pigs will thrive better if given the run of a paddock, and, if a good lucerne paddock is available, no other food is required until such time as they are ready to be topped off for market. Where pigs are given the run of a paddock it is necessary to provide a shelter shed which will protect them from the excessive heat of the sun in summer, and cold, bleak winds in winter. A cheap, rough shed with a roof of thatch, iron, or ruberoid is quite sufficient. The old theory, that to fatten a hog you have to shut him up in a small sty has now exploded, and pigs can be kept in small paddocks until ready for market. A pig fed in a sty, especially in the summer time, without the means of getting exercise, has a tendency to generate a sort of blubber or lard; whereas a pig who has his liberty and the means of taking exercise, produces meat of a firm streaky nature, so much appreciated in a slice of bacon. Fat bacon is at a discount at the present day, and the public demand a lean streaky bacon, and will not accept the fat bacon that was produced a few years ago; and the object should be to produce the class of bacon that is in demand.

BREEDING.—The period of gestation in the sow is 16 weeks, and a sow will generally have two litters each year. A sow may be used for breeding purposes when eight months old, thus having a litter when 12 months old; but as breeding from immature animals has a tendency to degenerate the race, it is better to allow the sow to become 12 months old before being used for breeding. During the time the sow is giving milk to her litter, she should have abundance of good, strengthening, milk-giving food, such as kitchen slops, crushed oats, or other corn, which will have a very beneficial effect at this time, and also have a good effect on the young ones. At three weeks old the young ones will commence to eat a little food, and a small suitable trough should be provided for them, and this should be so arranged that the old sow cannot get into it, and by this means a little milk or other strengthening food can be supplied to the young pigs. About a week before the sow is expected to farrow, she should be placed in a clean, roomy sty, in which is placed a quantity of chaff or shavings. It is not a good plan to use long straw, as the young pigs often crawl into the straw unseen by the sow, who is likely to lay on them and smother them. The best way to prevent this is to fix a piece of timber all round the sty a few inches away from the wall; this gives the young pigs a chance to get out of the way when the sow lies down. When a sow habitually overlies her young ones or eats them, as they are known to do at times, the sooner she is sent off to the butcher the better.

There is no more profitable animal on the farm if properly attended to than a well-bred pig; but scrubbers are generally a loss to the farm. A pig should be regarded as a machine for converting bulky and cheap food into a more concentrated and valuable form for market, and as such should be treated well. It should be remembered that the boar exercises a much greater influence on the progeny than the sow, and, therefore, a cross-bred or inferior boar should never be used for stud purposes, as he will probably throw back to his common ancestors. A herd of poor sows may be improved, and the progeny gradually improved to first-class animals, by the use of pure bred boars, but, however good the sows may be, if an inferior or cross-bred boar is used, the progeny will never be satisfactory. Good breeding and good feeding must both be studied if the best results are to be obtained.

The importance of providing a constant supply of good water for pigs, is often very much neglected. Pigs should be allowed to have constant access to fresh water, even when supplied with soft and sloppy food; they will drink large quantities of pure water, and will flourish much better when a plentiful supply of water is obtainable. If a good bath can be provided it will be much availed of by the pigs; a concrete trough, with a plug in the bottom from which the water can be let out every day, is very suitable for this purpose. Lumps of rock salt should be provided in such places that it is easy of access to the pigs; and a little sulphur occasionally mixed with their food will also have a beneficial effect. They are also very fond of charcoal, cinders, or even coal itself, of which they will eat considerable quantities, as it assists their digestion and helps to keep them in health.

Ringing Pigs.—This operation is performed in order to counteract the propensity swine have to dig and root up the earth. Several inventions have been introduced for this purpose. The old system was to put a horse-shoe nail through the snout, and several forms of rings are in use, but rings are always liable to come out, and a better mode of proceeding is, when the pigs are young, to cut through the cartilage into the proper nasal; the divided edges of the cartilage will never unite again, and the snout always remains powerless.

The Feeding of Pigs.—The milk of the sow is extremely rich; it contains twice as much caseine as cows' milk, and two and a-half times as much mineral matter, but not quite so much fat. It is thus exceedingly well fitted to nourishing young pigs, and accounts for the rapid growth of the young animals, who in one month often increase their weight tenfold. The brood sow will require, as already mentioned, plenty of good food to keep up a constant supply of this rich milk. A mixture of barley meal, pollard, and skim milk may be fed twice a day, with a grain ration at noon; and a liberal supply of roots will supply milk and also keep the sow in condition. When the pigs are about eight weeeks old they can be gradually weaned from the sow and fed on good food until they are able to look after themselves. Wheat is a complete feed for the mature pig, but depends on the price as to whether it is profitable to use as food. Wheat, barley, and peas are all excellent grains for producing pork, and if fed mixed together will produce excellent pork for bacon making. But it is not advisable to feed growing hogs upon grain alone, as they require a quantity of some much more bulky food. If a good pasture or lucerne paddock can be provided, the store pigs will almost do for themselves, but if this is not available they require quantities of some more bulky foods, such as root-crops, green maize, sorghum, field-cabbage, rape, kale, or such other crops as will suit the districts. If this cannot be obtained, clover or lucerne hay, moistened with steam or hot water, will prove very acceptable to them. Jerusalem artichokes are a very hardy crop, and will grow almost anywhere, and are a very valuable food for pigs, and they can be left to harvest the crop themselves. Skim milk is also a very valuable food; and where it can be obtained in quantities, and at a cheap rate, is very profitable to the pig farmer. In feeding pigs for profit the animals should never be allowed to receive a check in their growth; if starved at one time and fed well at another the results will never be satisfactory; the pig should be forced along from time of birth until fit for the butcher.

Cooked and Raw Feed.—There has always been a diversity of opinion of farmers as to the advantage of cooking feed for swine and other stock. While some assert that cooking food pays, others assert to the contrary. In addition to the value of the food the cost of cooking apparatus, fuel, etc., must be taken into account. Experiments carried out at the American Agricultural College show a loss through cooking the food, the loss being estimated at about 15 per cent., the food used for the experiment being maize, which was fed in both the raw and cooked state. Cooked food contains a much larger proportion of water than uncooked food, so that the daily consumption of food, apart from the water, is considerably less where raw food is used, a fact which should influence the mind of pig breeders.

Killing Pigs and Curing Pork.—A pig that is to be killed should be kept 12 to 16 hours without food. A good plan is to give the pig a sharp blow on the head with the blunt end of the hammer, right in the centre of the forehead. This will stun him and prevent much of the squealing generally attendant on pig-killing. He should then at once be stuck with a long knife in a slanting direction from the throat towards the heart, and every drop of blood should be got out of the body, or the pork will not cure well. The carcase is now immersed in scalding water, which should be at a temperature of 165 to 180 degrees. A good way to tell whether the water is at the right temperature is to take a particle of the clotted blood and throw it into the water. If the blood immediately assumes a whitish green tinge the water is too hot; but if the blood, in dissolving, retains its crimson colour in the water for about two seconds before it takes the greenish hue, it is just right, and the carcass should be immersed at once and allowed to remain from one to three minutes, according to the condition of the skin. If the blood, when thrown into the water, retains its colour for any length of time, the water is not hot enough, and more boiling water must be added. As soon as the hair will come off freely the pig should be scraped with a blunt instrument until all the hair is removed, and the skin should then be well dried. The entrails are then removed, and the carcass allowed to hang in a clean, airy place for twenty-four hours. It is then cut up into hams, hands, spare-ribs, loins, and belly-pieces. The parts required for curing are rubbed over with coarse salt and a little saltpetre, and laid on a table flesh uppermost so as to drain any blood. The system of dry-salting is the best, as the bacon is not so flabby as when steeped in brine. To make good bacon by the dry process, equal quantities of best Liverpool salt and brown sugar are used, with ¼oz. saltpetre to each pound of the mixture. This is thoroughly rubbed into the meat every second day, and the position of the meat changed at each rubbing, that is, the top portions at the bottom, and *vice versa*. The time taken depends on the size of the joints and the weather. The salt goes into the meat quicker in wet than in dry weather. From three to four weeks will be required for salting a good-sized animal. The salt is then washed off, and it is ready for smoking. For this purpose a small shed is generally erected, and the bacon hung from beams across the roof. The floor is then partly covered with hardwood sawdust, which is then lit and allowed to smoulder without producing any heat. It takes from about seven to 10 days to properly smoke bacon. Most of the bacon-curing of the present day is done on the factory system. These factories are supplied with refrigerating machinery and all the latest appliances, and can treat a large number of animals per day, turning out an even sample of bacon of the same quality all the year round, and no part of the animal is wasted.

AGRICULTURAL SHOWS.

GREENOUGH ANNUAL SHOW.

On the 7th inst. the thirtieth annual show was held at Greenough, under the auspices of the Greenough Farmers' Club. There was a good attendance. The exhibits in all classes were fairly numerous, and of undoubted quality, and the arrangements made by the committee, backed by Mr. Meadowcroft, the secretary, were admirable. The exhibits in farm produce deserved special mention, furnishing, as they did, striking evidence of the fertility of the Greenough soil under improved methods of husbandry. The following is the prize list:—

HORSES.

Cart sire: Jones Bros., 1; T. Cream, recommended for 2. Cart mare: Waldeck Bros., 1. Cart sire, W.A. bred: T. Cream, 1; D. Duncan, 2. Cart mare: W. Aherne, 1; D. Duncan, 2. Draught gelding: J. McCann, jun., 1; D. Duncan, 2. Cart filly: J. Aherne, 1; J. Waldeck, 2. Farm pair: D. Duncan, 1 and 2. Blood sire: J. Bishop, 1; R. Backshall, 2. Blood mare: J. Reynolds, 1; U. R. Leverman, 2.

Ring Events.

Jump at bar: W. Pell, 1; F. Waldeck, 2. Gent's hack: W. Hanlon, 1; H. Waldeck, 2. Lady's hack: H. Waldeck, 1; Miss Duncan, 2. Sulky turn-out: W. Hanlon, 1 and 2. Hunter: S. Harrison, 1; W. Pell, 2. Buggy pair: W. Hanlon, 1. Bareback riding: Harrison and Pell divided. Spring-cart or trap horse: J. Bell, 1; J. P. Connolly, 2. Fastest walker: Jas. Reynolds, 1; Miss Clarkson, 2.

CATTLE.

Bull for beef: R. Backshall, 1; H. E. Hamersley, 2. Dairy bull: Waldeck Bros., 1. Beef cow: Mrs. Dennison, 1; D. Duncan, 2. Fat bullock: C. L. Duncan, 1; W. Wilson, 2. Dairy cow, milk to be judged by weight: J. Reynolds, 1; W. Wilson, 2.

SHEEP.

Merino ram, W.A. bred: G. E. Sewell, 1; D. Duncan, 2. Three merino ewes: J. Waldeck, 1. Fat wethers: John Stokes, 1; S. McCarley, 2. Fat lambs: J. Waldeck, 1; John Stokes, 2. Coarse-wool ram: John Stokes, 1; J. R. Rumble, 2. Long-wool ewes: Miss Dennison, 1, John Stokes, 2.

PIGS.

Best boar: J. C. Thomson, 1; J. P. Rumble, 2. Best sow: J. Bell.

POULTRY.

Brown Leghorn cockerel: G. F. Burrows, 1. Pair brown Leghorns: G. F. Burrows, 1. Pair white Leghorns: G. F. Burrows, 1; W. H. James, 2. Pair Minorcas: W. H. James, 1. Orpingtons: Pearse and Herbert, 1. Andalusians: J. H. Fletcher, 1. Silver-laced Wyandottes: Pearse and Herbert, 1; J. Reynolds, 2. Langshans: Pearse and Herbert, 1. Turkeys: J. Reynolds, 1. Ducks, Indian runners: J. H. Fletcher, 1 and 2. Table ducks: T. Harrison 1; J. Reynolds, 2. First prize for birds unenumerated in the schedule were awarded to G. F. Burrows for white Wyandottes, A. H. Rolinson for Malay game, Pearse and Herbert for game bantams, and a second prize to the same breeder for Malay game.

GRAIN.

Quarter of flour: A. Clinch. Wheat: T. Rumble, 1; J. P. Rumble, 2. Oats: J. Reynolds, 1 and 2. Barley: J. Doyle, 1. Chaff: D. Duncan, 1; Jones Bros., 2.

VEGETABLES.

Kidney potatoes: Mrs. Wiley, 1. Potatoes: F. Ritchie, 1; D. Duncan, 2. Peas: J. P. Rumble, 1; J. Bridgeman, 2. French beans: J. C. Stokes, 1; J. McCartney, 2. Skinless peas: Miss Doyle, 1; J. Bridgeman, 2. Broad beans: Mrs. McCartney, 1; Miss Doyle, 2. Cabbage: W. Stokes, sen., 1; McCluskey Bros., 2. Cauliflowers: R. Backshal, 1; McCluskey Bros., 1. Lettuce: W. Stokes, sen., 1; R. Hollingsworth, 2. Onions, W. Stokes, sen., 1; J. C. Stokes, 2. Carrots: J. Bridgeman, 1; W. Stokes, 2. Turnips: McCluskey Bros., 1; D. Duncan, 2. Swedes: J. Reynolds, 1; Mrs. Browning, 2. Beetroot: J. P. Rumble, 1; D. Duncan, 2. Parsnips: Miss Doyle, 1; J. Bridgeman, 2. Radishes: E. Smith, 1; R. Russ, 2.

FLOWERS.

Hand bouquet: Miss Duncan, 1; Mrs. Eaton, 2. Garden flowers: Mrs. J. F. Moore, 1; Mrs. Eaton, 2. Wild flowers: Miss Hollingsworth, 1; Miss Cope, 2. Roses: Mrs. Wilson, 1; Mrs. Whitfield, 2. Pot plants: Mrs. Arma Blight, 1; Miss Duncan, 2. Wild flowers (under 16), prize donated by Mr. D. Duncan: Ada Eaton, 1; N. Browning, 2. Wild flowers (under 12), prize awarded by Mr. J. G. Smith: Amy Stokes, 1; Roy Marks, 2.

ORANGES.

Miss Logue, 1.

INDUSTRIAL.

Pickles: Mrs. J. F. Moore, 1. Jams: Mrs. Waldeck, 1; Miss Duncan, 2. Fruit in syrup: Mrs. A. Clinch, 1; Miss Logue, 2. Dressed poultry (prize donated by Mr. F. Clinch): Mrs. Woodhouse, 1. Bread: Mrs. Purcell, 1; Mrs. J. F. Rumble, 2.

DAIRY PRODUCE.

Bacon (middles): R. E. Morrell, 1; H. and J. Broad, 2. Boiled bacon: H. and J. Broad, 1. Ham: H. and J. Broad, 1; J. F. Rumble, 2. Butter: J. Bridgeman, 1; W. F. Stansfield, 2.

The following special awards were made for exhibits not enumerated in the schedule:—Cape gooseberries: J. W. Logue. Rhubarb: E. W. Clarkson. Designs in everlasting wild flowers: Mrs. A. Blight.

YORK AGRICULTURAL SHOW.

One of the most successful shows of the season may be claimed to be that opened at York on October 15th. The arrangements were good and the exhibits numerous. The prize list is as follows:—

HORSES.

Judges: Messrs. J. Nicholas and J. N. Taylor.

Draught entire: W. T. Craig's "Royal Blue," 1; Teesdale Smith's "Cardinal," 2. Draught brood mare: C. McQuade, 1; W. and N. Burges, 2. Draught dry mare: T. H. Wilding, 1; Estate late J. H. Monger, 2. Draught entire colt: Hy. Wills and Co.'s "Prince Albert II.," 1; Estate late J. H. Monger, "Young Blue," 2. Draught mare (three years and under): T. H. Wilding, 1 and 2. Draught gelding: R. G. Burges, 1; A. B. Lodge, 2.

Draught foal: W. and H. Collins, 1; T. H. Wilding, 2. W.A. bred Horses.—Draught entire: W. and H. Collins. Draught mare (in foal): T. H. Wilding, 1; C. McQuade, 2. Draught colt (two years): M. Stone, 2. Draught colt (one year): T. H. Wilding. Draught filly (two years): T. H. Wilding, 1; W. Smith, 2. Draught filly (one year): T. H. Wilding, 1; R. G. Scott, 2. Yearling, by "Royal Blue," R. G. Scott. Two-year-old colt or filly, by "Ailsa Craig": M. Stone. Blood Horses.—Entire: Estate late J. H. Monger, 1. Mare: T. H. Wilding, 1; Geo. Lukin, 2. Filly: Marwick Bros., 1. Foal, by "General Buller": T. Smith, 1. Roadster stallion: W. T. Craig's "Silverweight," 1. Buggy Horses.—Single horse: Butler, Lacy, and Co., 1; Gallaird, 2. Pair ponies: Butler, Lacy, and Co., 1. Single pony: H. Ewert, 1; F. Ewell, 2. Trotter, in saddle: Lander and Gillespie, 1. Hacks.--Gentleman's hack: F. C. Thomas, 1. Lady's hack: W. G. Burges, 1; W. Brogan, 2. High jump: F. K. Cooper (4ft. 6in.), 1; A. B. Lodge, 2.

DOGS.

Judges: Messrs. W. J. Smyth, S. C. Paul, and A. Le Souef.

Collie.—Novice dog: S. C. Paul, 1; W. Barlow, 2. Puppy dog: S. C. Paul, 1; G. Woodhouse, 2. W.A. bred dog: S. C. Paul, 1; G. Woodhouse, 2. Class dog: S. C. Paul, 1; G. Woodhouse, 2. Puppy bitch: S. C. Paul, 1. W.A. bred bitch: S. C. Paul, 1 and 2. Class bitch: S. C. Paul, 1 and 2. Any other variety Collie dog: J. F. Taylor, 2. Smithfield dog: A. F. Newcome, 1; Miss Amy Fisher, 2.

Deerhounds.—Class dog: W. H. Bramwell, 1. Class bitch: W. H. Bramwell, 1 and 2.

Kangaroo Dogs.—Class dog: W. H. Bramwell, 1. Class bitch: W. H. Bramwell, 2.

Setters.—English class dog and English W.A. bred bitch: Chas. Coulsson, 1. English open class bitch: Chas. Coulson, 1. Gordon open class dog: Geo. M. Neville, 1: L. H. Sherlock, 2.

Cocker Spaniels.—Puppy (black bitch): M. Milner, 1; Mrs. W. Swan, 2. W.A. bred (black bitch): Mrs. J. C. Strickland, 1. Open class (black bitch): Mrs. J. C. Strickland, 1. A.O.C. (dog or bitch): Mrs. J. C. Strickland, 1.

Retriever.—Dog or bitch: J. H. Wansborough, 2. Puppy dog: F. H. Robertson, 1. Open class (dog): W. J. Smyth, 1.

Fox Terriers.—Novice bitch: E. W. Main, 1. Puppy bitch: W. J. Smyth, 1; W. Jury, 2. W.A. bred bitch: Jas. Carter, 1; W. Jury, 2. Open class bitch: Jas. Carter, 1; W. Jury, 2.

Irish Terriers.—Novice dog: W. J. Smyth, 1; Puppy dog: W. J. Smyth, 1. W.A. bred dog: W. J. Smyth, 1. Open class dog: W. J. Smyth, 1. Novice bitch: W. J. Smyth, 1. Puppy bitch: W. J. Smyth, 1. W.A. bred bitch: W. J. Smyth, 1. Open class bitch: W. J. Smyth, 1.

Bull Terriers.—Puppy dog: J. R. Chivers, 1; A. Douglas, 2. Open class dog: J. R. Chivers, 1; H. Thompson, 2. Puppy bitch: F. D. Winell, 1. Open class bitch: H. G. Prain, 1; F. Durnell, 2.

Airedales.—Open class dog: C. W. Coombe, 1.

Pugs.—Open class dog: J. H. McCormack, 1. Open class bitch: Mrs. M. T. Reed, 1: H. Ewert, 2. A.O.V. dog: E. Philp, 2. A.O.V. dog (W.A. bred): Dr. S. B. Davis, 1.

Brace classes.—Irish terriers: W. J. Smyth, 1. Fox terriers: W. J. Smyth, 2. Collies: S. C. Paul, 1. Collie team: S. C. Paul, 1. Brood bitch (with litter): A. F. Newcombe, 1.

CATTLE.

Judges: Messrs. A. Crawford, Dempster, Watson, and W. Smith.

Bull for beef: A. W. Edgar, 1; T. H. Wilding, 2. Bull for dairy: A. Ferguson, 1; Estate late J. H. Monger, 2. Cow for beef: A. W. Edgar, 1; T. H. Wilding, 2 Cow, in full milk: R. G. Burges, 1 and 2. Ayrshire cow: R. G. Burges, 1 and 2. Jersey cow: George Lukin, 1. Two fat beasts: W. McDonald, 1; T. H. Wilding, 2. Dairy heifer: M. Grigson, 1. Beef heifer: A. W. Edgar, 1; M. Grigson, 2.

SHEEP.

Judges: Messrs. V. Hammersley, Lockyer, and Walsh.

Merino ram (4-tooth or over): Henry Wills and Co., 1 and 2. Merino ram (2-tooth): Estate late J. H. Monger, 1 and 2. Two Merino ewes (4-tooth): Estate late J. H. Monger, 1 and 2. Two Merino ewes (2-tooth): Henry Wills and Co., 1; Estate late J. H. Monger 2. Pen merino ram and two ewes: Estate late J. H. Monger. Champion merino ram: Henry Wills and Co., 1. Champion merino ewe: Henry Wills and Co., 1. Two crossbred ewes: Marwick Bros., 1; R. G. Scott 2. Crossbred ram: Geo. Lukin 1 and 2. Shropshire ram: Henry Wills and Co., 1 and 2. Two Shropshire ewes: R. G. Burges, 1 and 2. Lincoln ram: Marwick Bros., 1 and 2. Two Lincoln ewes: Marwick Bros., 1 and 2. W.A. bred Lincoln pair: E. Parker, 1. Romney Marsh ram: T. H. Wilding, 1; Estate late J. H. Monger, 2. Romney Marsh ewes: G. Linto, 1; Estate late J. H. Monger, 2. Leicester ram: R. G. Scott, 1. Champion long-wool ram: Marwick Bros., 1. Champion long-wool ewe: Marwick Bros., 1 Five fat lambs: T. H. Wilding, 1 and 2. Five fat wethers: E Parker, 1; T. H. Wilding, 2. Five fat ewes: R. G. Burges, 1; E. Parker, 2.

PIGS.

Judges: Messrs. Watson and Smith.

Berkshire boar: E. Keane, 1; R. G. Burges, 2 Berkshire boar (under 12 months): C. A. Harvey and Co., 1. Berkshire sow: R. G. Burges, 1; F. Rewell, 2. Yorkshire boar: J. R. Mackie, 1. Yorkshire sow: F. Rewell, 1. Sow and litter: F. Rewell, 1; F. J. R. Lloyd, 2 Six porkers: C. A. Harvey and Co.

IMPLEMENTS.

Judges: Messrs. McDonald, Nicol, and Roche.

Collection agricultural implements: State Manufacturing Co., 1; C. R. Knight and Co., 2. Collection agricultural implements (W A.): G. Smith, 1 A. Powell, 2. Farm wagon (W.A.): A. Bradshaw and Son, 1. Farm dray (W.A.): A. Bradshaw and Sons, 1. Sulky W.A.): Victoria Carriage Co 1 Buggy (W.A.): Victoria Carriage Co., 1. Single-hooded buggy: G. H. Smith, 1. Sulky: Victoria Carriage Co., 1. Single-hooded buggy (Eastern districts): G. H. Smith, 1. Sulky (Eastern districts): T. Wheeler, 1. Spring cart (Eastern districts): G. H. Smith, 1. Cart harness: J. W. Hardwick, 1. Dray harness: J. W. Hardwick, 1. Single-buggy harness: J. W. Hardwick, 1. Springcart harness: J. W. Hardwick. Stock saddle: J. W. Hardwick, 1. Ordinary saddle: J W. Hardwick, 1.

PRODUCE.

Judges: Messrs. Gardner, Carter, and Lowe.

Fifty pounds flour: Quigley and Edwards, 1. 50lbs. bran: Quigley and Edwards, 1. 50lbs. pollard: Quigley and Edwards, 1. 50lbs. wheat: A. Griegson, 1; M. Griegson, 2. 50lbs. oats: Marwick Bros., 1; W. T. Craig, 2. 50lbs. English barley: Estate late J. H. Monger, 1. 50lbs. Cape barley: H. and W. F. Penny, 1; R. G. Burges, 2. Sheaf wheat: J. McCarty, 1 and 2. Sheaf barley: J. McCarty, 1 and 2. Sheaf oats; H. and W. F. Penny, 1; W. and F. Burges, 2. Bag chaff: A. Griegson, 1; H. and J. Carr, 2.

MISCELLANEOUS.

Judges: Messrs. Gardner, Carter, Lowe, Lockyer,
Walsh, and Hamersley.

Bread: H. Thielman, 1; A. H. Mercer and E. Kilmartin, tie. Home-made bread: Miss S. Penny, 1; Miss K. Linto, 2. Butter: R. G. Burges, 1 and 2. Collection hams and bacon: C. A. Harvey and Co., 1. One ham (farmers only): M. Griegson, 1; A. Griegson, 2. Collection wine: W. and H. Logue, 1; C. M. Ferguson, 2. Collection preserves: T. C. Evans, 1; T H. Wilding, 2. Collection jams: Mrs. M. Jacoby, 1. Bunch carrots: K. Edwards, 1; H. and W. F. Penny, 2. Bunch parsnips: K. Edwards, 1. Bunch turnips: J. B. Ding, 1; E. Ashworth, 2. Beans and peas: J. T. Parker, 1. Potatoes: J. B. Ding, 1. Cauliflowers: J. B. Ding, 2. Cabbages: K. Edwards, 1; W. Priest, 2. Lettuce: G. Williams, 1. Collection vegetables: J. B. Ding, 1; S. Hogan, 2. Display locally-grown vegetables: J. B. Ding, 1. Honey: C. and A. H. Smith, 1; E. Ashworth, 2. Lemons: K. Edwards, 1; Illawarra Co., 2. Oranges: W. J. Bird, 1 and 2. Apples: Illawarra Co., 1; M. Jacoby, 2. Merino fleeces: A. Nicholson, 1. Crossbred fleeces: J. Taylor, 1; G. Linto, 2. Pure-bred longwool fleeces: A. N. Nicholson, 1. Plate scones: Mrs. T. C. Evans, 1; Mrs. J. H. Wansborough. 2. Collection home-made pastry: Mrs. Wansborough, 1; Mrs. R. Gallop, 2.

HORTICULTURAL.

Judge: Mr. J. Hawter.

Pot Plants.—Six distinct plants: T. C. Evans, 1. Pot plants in bloom: Mrs. J. Seabrook, 1. Pelargonium in bloom: T. Harkness, 1. Foliage plant: Mrs. J. L. Wansborough, 1. Palm: T. Harkness, 1.

Cut Flowers.—Twelve varieties (shown separately): J. C. Windsor, 1; J. B. Dean, 2. Collection garden flowers; J. C. Windsor, 1; Mrs. J. Seabrook, 2. Collection wild flowers: Mrs. R. Gallop, 1; Miss B. Taylor, 2. Twelve roses: W. King, 1; K. Edwards, 2. Six roses: W. King, 1; K. Edwards, 2. Three roses: Miss Jessie Evans, 1; W. King, 2. Champion rose: Miss Jessie Evans, 1. Three carnations: T. Harkness, 1 and 2. Specimen glasses: Miss Jessie Evans, 1; Mrs. A. H. Windsor, 2. Buttonhole bouquets: W. K. Congreave, 1; Miss Z. Seabrook, 2. Dress spray: Mrs. A. H. Windsor, 2. Hand bouquet (garden flowers): Mrs. J. Seabrook, 1. Hand bouquet (wild flowers): Mrs. R. Gallop, 1. Buttonhole bouquets (children): Miss Ruby Edwards, 1; Miss Jessie Evans, 2. Floral design (children): Miss C. Ashworth, 1.

INDUSTRIAL.

Judges: Messrs. A. Crawford, W. Paterson, and R. Hummerston.

Collection manures: Forrest, Emanuel, & Co., 1. Native grasses: Mrs. R. Gallop, 1. Lucerne: J. B. Ding, 1. Pottery: C. Edwards, 1. Aerated waters: J. Mosely, 1. Dressed hay or straw: R. G. Burges, 1 and 2. Hive of bees: C. H. Smith, 1.

POULTRY.

Judges: Messrs. R. Deering and J. F. Tipping.

Brahmas.—Cock and cockerel: L. S. Squires, 1 Hen or pullet: W. J. Smyth, 1 and 2.

Dorkings.—Cock or cockerel: W. Padbury, 1; W. J. Smyth, 2. Hen or pullet: W. J. Smyth, 1 and 2.

Langshans.—Cock or cockerel: W. Padbury, 1; W. J. Smyth, 2. Hen or pullet: W. J. Smyth, 1 and 2. W.A. bred cock or cockerel: W. Padbury, 1; W. J. Smyth, 2. W.A. bred hen or pullet: W. J. Smyth, 1; W. Padbury, 2.

Game (British): Black red (cock or cockerel): F. Rewell, 1; W. Black, 2. Black red (hen or pullet): F. Rewell, 1; W. J. Smyth, 2. Any other colour (cock or cockerel): Geo. Allman, 1 and 2. Any other colour (hen or pullet): Geo. Allman, 1; W. J. Smyth, 2. Any colour, cock or cockerel; (W.A. bred): W. Black, 1; Geo. Allman, 2.

Game (Indian).—Hen or pullet: W. J. Smyth, 1 and 2.

Malays.—Black red (cock or cockerel): J. Deering, 1; J. Loughlin, 2. Black red (hen or pullet): Cairns Candy, 1; J. Loughlin, 2. Any other colour (cock or cockerel): J. Freese, 1; Cairns Candy, 2. Any other colour (hen or pullet); J. Freese, 1, L. Deering, 2. W.A. bred (any colour, cock or cockerel): J. Freese, 1; L. Deering, 2. W.A. bred (any colour, hen or pullet): J. Freese, 1; Mrs. L. Deering, 2.

Australian Game.—Cock or cockerel: J. Freese, 1; W. Black, 2. Hen or pullet: W. Black, 1 and 2.

Orpingtons.—Black S.C. cock or cockerel: Alphington Poultry Yards, 1; L. Deering, 2. Black S.C. hen or pullet: Alphington Poultry yards, 1; Mrs. L. Deering, 2. Buff S.C. cock or cockerel: W. J. Smyth, 1; A. J. Prince, 2. Buff S.C. hen or pullet: W. Padbury, 1; A. J. Prince, 2. W.A. bred (A.V. cock or cockerel: W. Padbury, 1 and 2. W.A. bred (A.V.) hen or pullet): Alphington Poultry Yards, 1; Mrs. L. Deering, 2.

Hamburgs.—Cock or cockerel: W. Padbury, 1; L. Deering, 2. Hen or pullet: W. Padbury, 1; G. D. Oliver, 2.

Andalusian.—Cock or cockerel: Alphington Poultry Yards, 1; G. A. Hurd, 2. Hen or pullet: G. A. Hurd, 1 and 2. W.A. bred cock or cockerel: Alphington Poultry Yards, 1. W.A. bred hen or pullet: G. A. Hurd, 1 and 2.

Minorcas.—Cock or cockerel: H. J. Easey, 1; J. Fowler, 2. Hen or pullet: W. H. James, 1; H. J. Easey, 2, W.A. bred cock or cockerel: W. Barlow, 2. W.A. bred hen or pullet: H. J. Easey, 1; A. Savage, 2.

White Leghorns.—Cock or cockerel: T. G. Halbert, 1; Alphington Poultry Yards, 2. Hen or pullet: C. and F. Mason, 1; H. C. Napthely, 2. W.A. bred cock or cockerel: H. Thielman, 2. W.A. bred hen or pullet: C. and F. Mason, 1 and 2.

Brown Leghorns.—Cock or cockerel: Alphington Poultry Yards, 1; G. F. Burrows, 2. Hen or pullet: G. F. Burrows, 1; Alphington Poultry Yards, 2. W.A. bred cock or cockerel: Alphington Poultry Yards, 1 and 2.

A.O.V. Leghorn.—Cock or cockerel: J. D. Smith, 1; D. J. Grady, 2. Hen or pullet; D. J. Grady, 1; J. D. Smith, 2.

Campines.—Cock or cockerel: Chas. Smith. Hen or pullet: Chas. Smith.

Plymouth Rocks.—A.V. cock or cockerel: W. Padbury, 1 and 2. A.V. hen or pullet: W. Padbury, 1 and 2. A.V. cock or cockerel (W.A. bred): W. Padbury, 1 and 2. A.V. hen or pullet (W.A. bred): W. Padbury, 1 and 2.

Wyandottes.—Silver-laced cock or cockerel: Mrs. L. Deering, 1; Alphington Poultry Yards, 2. S.L. hen or pullet: L. Deering, 1; W. J. Smyth, 2. Gold-laced cock or cockerel: W. Padbury, 1; Mrs. R. Seckold, 2. G.L. hen or pullet: W. J. Smyth, 1; Mrs. L. Deering, 2. White cock or cockerel: G. F. Burrows, 1; Mrs. R. Seckold, 2. White hen or pullet: G. F. Burrows, 1; Mrs. R. Seckold, 2. W.A. bred (A.V.) cock or cockerel: W. Padbury, 1; Alphington Poultry Yards, 2. W.A. bred (A.V.) hen or pullet: Alphington Poultry Yards, 1; L. Deering, 2.

Bantams.—Game cock or cockerel: W. J. Smyth, 1; W. Padbury, 2. Game hen or pullet. W. J. Smyth, 1. A.O.V. cock or cockerel: Cairns Candy, 1. A.O.V. hen or pullet: Cairns Candy, 1 and 2.

Selling Class.—Cock or cockerel: Utility Poultry Farm, 1; W. Padbury, 2. Hen or pullet: Alphington Poultry Yards, 1; A. J. Prince, 2.

A.V. turkey cock: F. J. R. Lloyd, 1; W. Padbury, 2. A.V. turkey hen: F. J. R. Lloyd, 2.

Ducks.—Aylesbury drake: Mrs. L. Deering, 1; W. Padbury, 2. Aylesbury duck: Mrs. L. Deering, 1; W. Padbury, 2. Rouen drake: J. Burton, 1. Pekin drake: F. W. Reid, 1; F. Rewell, 2. Pekin duck: F. W. Reid, 1; F. Rewell, 2. *Indian runner drake*: C. *and* F. Mason, 1; C. *W. Johnson*, 2. Indian runner duck: Mrs. L. Deering, 1; F. W. Reed, 2. W.A. bred (A.V.) drake: W. Padbury, 1; C. W. Johnson, 2. W.A. bred (A.V.) duck: W. Padbury, 1.

Geese.—Toulouse gander: W. Padbury, 1 and 2. Toulouse goose: W. Padbury, 1 and 2. A.O.V. gander: J. T. Parker and F. Craig, 1; W. Padbury, 2. A.O.V. goose: W. Padbury, 1.

Table Fowl.—Cockerel: T. G. Halbert, 1. Pullet: T. G. Halbert, 1.

Dozen Hen Eggs.—K. Edwards, 1; J. Prinster, 2.

Dozen Duck Eggs.—W. J. Bird, 1; J. Gault, 2.

Breeding Pens.—Minorcas: J. F. Cudihey, 1; C. and F. Mason, 2. Wyandottes: W. D. Oliver, 1; W. Padbury, 2.

Greatest Number Entries in Poultry.—W. Padbury (gold medal).

TEAMS.

Judge: Mr. J. N. Taylor.

Pair of Plough Horses (W.A. bred): A. B. Lodge, 1. Four-horse team (two abreast, open class): Teesdale Smith, 1; A. B. Lodge, 2. Four-horse team (two abreast, W.A. bred): A. B. Lodge, 1. Best dressed four-horse team and wagon: H. Teesdale Smith, 1; A. B. Lodge, 2. Two-horse team (dray or wagon): Teesdale Smith, 1; A. B. Lodge, 2.

Hunters (14·2 a.o.): F. C. Thomas's "Strongbow," 1; F. H. Blechynden's "War Cloud," 2.

Pony (13·2 a.u.): J. Owens, 1; R. McDonald, 2.

Pony High Jump: A. Scott, 1; J. W. Marwick, 2.

Best Lorry and Horse: Quigley and Edwards, 1.

Boys' Log-Chopping (13-inch log): W. Green, 5 seconds, 1; J. Green, 10 seconds, 2.

Tradesman's Turnout: J. H. Wansborough, 1; H. Thielmann, 2.

Tilting at the Ring: A. McDonald, 1; J. H. Moss, 2.

Handicap Chop (18-inch log): R. Thompson, 15 seconds, 1; G. Mudford, 20 seconds, 2.

Sheep-Shearing Contest: W. Green, 17½ minutes, 3 sheep, 1.

Pigeon Homing Race (York to Perth): A. T. Morgan, 1; A. G. Hames, 2; Geo. Brady, 3.

Shorn Pen of Five Wethers: T. H. Wilding, 1.
Best Yearling by "Silverweight": J. Seabrook, 1.

ROYAL AGRICULTURAL SHOW.

The twenty-seventh annual Show of the Royal Agricultural Society was opened on the Show Grounds, Guildford, on October 20th, when the following awards were allotted:—

Horses.

Thoroughbreds.—Stallion: W. B. Wood's "Jay Rye," 1; Cockram and King's "Ormuz," 2. Mare, visibly in foal or with foal at foot: Maud Dempster's "Maoriland," 1; Cockram and King's "Miss Tranter," 2. Bred in Western Australia—Stallion: H. E. King's "Havelock," 1. Colt, two years old: W. B. Wood's "Jayomi," 1; Cockram and King's "Landholme," 2. Mare, visibly in foal or with foal at foot: E. Roberts's "Florrie," 1; T. H. Wilding's "Essie," 2. Filly, two years old: E. Roberts's "Miss Tremando," 1; Cockram and King's "Sea Flirt," 2. "Saunders' Cup," for the exhibitor gaining the highest number of points: W. B. Wood. Champion thoroughbred stallion: W. B. Wood's "Jay Rye." Thoroughbred mare: E. Roberts's "Florrie."

Roadsters.—Roadster stallion; G. A. Sutton's "Childe Harold II.," 1; W. T. Craig's "Silverweight," 2. Trotting stallion: Hy. Wills and Co's. "Osterley's Pride," 1.

Draughts.—Stallion, three years or over: W. T. Craig's "Royal Blue," 1; M. Edwards's "Pride of Clyde," 2; H. Teesdale Smith's "The Cardinal," 3. Stallion, under three years: Hy. Wills and Co's. "Prince Albert II.," 1; Hy. Wills and Co's. "Duke of Werna," 2; J. F. Johnston's Royal Ben," 3. Mare, visibly in foal or with foal at foot; Maud Dempster's "Podge." Dry mare or filly: James Spier's "Heather Bloom," 1; T. H. Wilding's "Gyp," 2. Gelding, any age: W. Watson, 1; T. Lavers, 2. Bred in West Australia—Stallion, three years old or over: Taylor Bros.' "Lord Roberts," 1. Two-year-old stallion: Bro. Ramiro's "Murray," 1; J. P. O. Wellard's "Coronation," 2. Yearling stallion; T. H. Wilding's "Conqueror," 1; Wedge and Harper's "Punch," 2. Mare, any age, visibly in foal or with foal at foot: T. H. Wilding, 1; Maud Dempster, 2. Mare, three years old; T. H. Wilding, 1 and 2. Two-year-old filly: T. H. Wilding, 1; Bro. Ramiro, 2. Yearling filly; Hy. Wills and Co.

Suffolks.—Mare or gelding: W. Veal, 1.

Champion Prizes.—Draught stallion: W. T. Craig's "Royal Blue." Draught mare: J. Spiers's "Heather Bloom." Draught mare, bred in West Australia: T. H. Wilding's "Magnet."

Tandem turnout, 14·2 or over: J. Stuart, 1. Tandem turnout, under 14·2: E. H. Stirling, 1; W. Pearson, 2. Trotting pony, not over 14 hands: W. Davis, 1. Pony, not over 13·2: T. T. Ridgway, 1; F. C. Kinninment, 2. Four-in-hand: S. P. Emanuel, 1. Lorry pair, light: W. H. McCormack, 1; Hy. Wills & Co., 2. Lorry pair, heavy: W. H. McCormack, 1. Hunter, to carry not less than 13st.: F. C. Thomas's "Strongbow," 1; L. Clarkson's "Lang Syne," 2. Hunting pony, not exceeding 14·2: A. R. Barkla, 1; A. F. Crossman, 2. Spring cart horse: E. J. Hayes, 1; D. Mills, 2.

Tip-dray turnout, to include horse, tip-dray and harness: W. Watson, 1; J. Spiers, 2. Lorry horse; J. Lavers, 1. Pony turn out (pony under 12 hands): J. Nicholls & Co., 1; F. C. Kinninment, 2.

Sheep.

Merinos.—Ram, two years or over: Newmarracarra Estate, 1; Hy. Wills, and Co., 2. Ram, one year and a-half or under: W. V. Sewell, 1. estate late J. H. Monger, 2. Ewe, two years or over; Hy. Wills and Co., 1; estate, late J. H. Monger, 2. Ewe, one year and a-half or under; Hy. Wills and Co., 1; estate late J. H. Monger, 2. Ram, two years or over: T. H. Wilding, 1; estate late J. H. Monger, 2. Ram, one year and a-half or under; estate late J. H. Monger, 1 and 2. Ewe, two years or over: Newmarracarra Estate, 1; estate late J. H. Monger, 2. One year and a-half or under: W. V. Sewell, 1; estate late J. H. Monger, 2. Pen five merino ewes, under 18 months (for President's Cup): Estate late J. H. Monger, 1; G. C. Rowe, 2. Special prize for best ram not over six-tooth: Newmarracarra Estate, 1. Special prize for W.A.-bred ram: T. H. Wilding.

Champion Prizes.—Best ram: Newmarracarra Estate. Best ewe: Hy. Wills and Co.

Coarse Wool.—Lincoln ram, two years or over: Marwick Bros., 1; Monger's Estate, 2. One year and a-half or under: H. Wills & Co., 1. Leicester ram, two years or over: A. R. Adam, 1. One year and a-half or under: A. R. Adam, 1. Shropshire ram, two years or over: A. W. Edgar, 1 and 2; Hy. Wills & Co., 3. One year and a-half or under: H. Wills & Co., 1; G. C. Rose, 2; Marwick Bros., 3. Romney Marsh ram, two years or over: H. J. Saunders, 1; T. H. Wilding, 2. One year and a-half or under: Monger's Estate, 1 and 2. Southdown ram, two years or over: H. Wills & Co., 1. One year and a-half or under: H. Wills & Co., 1. Lincoln ewe, two years or over: H. Wills & Co., 1 and 2; Monger's Estate, 3. One year and a-half or under: Marwick Bros., 1 and 2. Leicester ewe, two years or over: A. R. Adam, 1. Shropshire ewe, two years or over: A. W. Edgar, 1, 2, and 3. One year and a-half or under: A. W. Edgar, 1; Hy. Wills & Co., 2; G. C. Rose, 3. Romney Marsh ewe, two years or over: Monger's Estate, 1 and 2. Southdown ewe, two years or over: Hy. Wills & Co., 1. One year and a-half or under: Hy. Wills & Co., 1. Pen of five Shropshire ewes, two-tooth, bred in Western Australia: J. P. O. Wellard, 1 and 2

Champion Classes.—Ram, in Lincoln, Leicester, and Romney Marsh classes: Hy. Wills & Co. Ram, in Shropshire and Southdown classes: A. W. Edgar. Ewe, in Lincoln, Leicester, and Romney Marsh classes: Marwick Bros. Ewe in Shropshire and Southdown classes: A. W. Edgar.

Fat Sheep.—Five merino wethers: T. H. Wilding, 2. Five coarse wool wethers: T. H. Wilding, 1 and 2. Pen of five coarse wool lambs: T. H. Wilding, 1 and 2; A. W. Edgar, 3. Shorn (ribbed and quartered) sheep or lambs: T. H. Wilding, 1; Wedge & Harper, 2.

CATTLE.

Beef Cattle (Shorthorns)—(Judge, Mr. Isaac Wood).—Bull, 3 years or over: A. W. Edgar 1; S. J. Phillips, 2; 2 years and under 3. A. W. Edgar, 1 and 2; 1 year and under 2 years: A. W. Edgar, 1 and 2; under 12 months, A. W. Edgar, 1 and 2. Cow, 3 years old or over: A. W. Edgar, 1 and 2. Heifer or cow, 2 years and under 3 years: A. W. Edgar, 1 and 2. Heifer, 1 year and under 2 years: A. W. Edgar, 1 and 2; under 12 months: A. W. Edgar, 1 and 2. Pair shorthorns (bull and heifer): A. W. Edgar, 1.

Herefords.—Cow, 3 years or over: A. W. Edgar, 1; J. Drummond, 2. Heifer, over 1 year and under 2 years: J. Drummond.

Polled Angus.—Cow, three years or over: E. Roberts, 1 and 2.

Champion classes.—Shorthorn bull: A. W. Edgar. Hereford bull: Not deserving. Polled Angus bull: No exhibit. Devon bull: No exhibit.

Shorthorn heifer or cow: A., W. Edgar. Hereford heifer or cow: A. W. Edgar. Polled Angus heifer or cow: E. Roberts. Devon heifer or cow: No exhibit.

Best fat beast: E. Roberts, 1 and 2. Special prize for best fat beast bred in this State, not over 3 years of age: J. Cook, jun., 1; E. Roberts, 2.

Dairy Cattle (Ayrshire)—Judge, Mr. R. E. Weir.—Bull, 3 years or over: Miss Maud Dempster, 1; H. J. Saunders, 2. Under 12 months: H. J. Saunders, 1; Miss M. Dempster, 2. Cow, 3 years or over: H. J. Saunders, 1; Miss M. Dempster, 2. Heifer or cow, 2 years and under 3 years: Miss M. Dempster, 1; E. W. Loton, 2. Heifer, 1 year and under 2 years: E. W. Loton, 1 and 2.

Jersey.—Bull, 2 years and under 3 years: W. Traylen, 1; F. Piaggio, 2. One year and under 2 years: W. Traylen, 1; Dempster and Walsh, 2. Under 12 months: W. Traylen, 1. Cow, 3 years or over: W. Traylen, 1; G. D. Robinson, 2. Heifer or cow, 2 years and under 3 years: T. H. Wilding, 1; Cockram and King, 2. Heifer, 1 year and under 2 years: J. M. Y. Stewart, 1; W. J. Reardon, 2. Under 12 months: J. Coultas, 1; J. Minchin, 2.

Shorthorn (milking strain).—Bull, any age: A. W. Edgar, 1 and 2. Heifer or cow, any age: Hy. Wills and Co., 1; A. W. Edgar, 2.

Champion Prizes.—Shorthorn bull: A. W. Edgar. Ayrshire bull: Miss M. Dempster. Jersey Bull: W. Traylen. Shorthorn (milking strain) bull: A. W. Edgar. Shorthorn heifer or cow: Hy. Wills and Co. Ayrshire heifer or cow: H. J. Saunders. Jersey heifer or cow: W. Traylen. Shorthorn (milking strain) heifer or cow: Hy. Wills and Co. Special prize—Dairy cow: Miss M. Dempster.

PIGS.

Berkshires.—Boar, over 12 months: H. J. Saunders, 1; J. Faulkner, 2 and 3. Sow: H. J. Saunders, 1 and 2; J. E. Starkie, 3. Boar: 12 months or under: H. J. Saunders, 1; J. Faulkner, 2; J. E. Starkie, 3. Sow, 12 months or under: H. J. Saunders, 1; W. Padbury, 2. Sow (any age), in milk with litter: G. D. Robinson, 1 and 2; W. Padbury, 3.

Yorkshires (Large).—Boar, over 12 months: G. W. Stubbs, 1. Sow, over 12 months: G. W. Stubbs, 1.

Any Other Breed.—Boar: G. M. Richardson, 1. Pen of three porkers, under six months: G. M. Richardson, 1. Brood sow, any breed, between 12 and 18 months: W. Marsh, 1; C. Cook, 2.

Special Prizes.—Highest number of points in Berkshire classes: H. J. Saunders (23 points), 1. Highest number of points in Yorkshire classes: G. W. Stubbs (16 points), 1. Other special: G. D. Robinson.

Champion Prizes.—Berkshire boar: H. J. Saunders. Berkshire sow: H. J. Saunders. Yorkshire boar: G. W. Stubbs. Yorkshire sow (large): G. W. Stubbs. Yorkshire sow (medium): G. M. Richardson.

POULTRY.

Champion Prize.—Cock or cockerel: W. Padbury. Hen or pullet: W. J. Smyth.

Black Spanish, cock or cockerel: W. J. Smyth. Brahma, hen or pullet: W. H. Smyth, 1 and 2. Dorking, any colour, cock or cockerel: W. H. Smyth, 1 and 2: W. Padbury, 3. Hen or pullet: W. H. Smyth, 1 and 2; W. Padbury, 3. Malay, any colour, cock or cockerel: Cairnes Candy, 1; Mrs. Deering, 2. Hen or pullet: Cairnes Candy, 1. British game, black-red, cock or cockerel: W. Black, 1; G. Timms, 2. Hen or pullet: W. J. Smyth, 1; G. Timms, 2. Any other colour, cock or cockerel: G. Allman, 1. Hen or pullet: G. Allman, 1; W. J. Smyth, 2. Indian game, cock or cockerel: Government Industrial School, 1; W. J. Smyth, 2. Hen or pullet; W. J. Smyth, 1; H. Stinton, 2. Hamburg, silver or golden spangled, cock or cockerel: Mrs. Deering, 1; W. Padbury, 2. Hen or pullet: W. Padbury, 1 and 2; Mrs. Deering, 3. Wyandottes—Golden cock: W. Padbury, 1; Mrs. Seckold, 2. Cockerel: Mrs. Seckold, 1; E. W. Ryton, 2. Pullet: Mrs. L. Deering, 1 and 2. Pullet: Mrs. R. Seckold, 1; Mrs. L. Deering, 2. Silver cock: Mrs. L. Deering, 1; W. J. Smyth, 2. Cockerel: P. D. Sullivan, 1; Mrs. L. Deering, 2. Silver hen: W. J. Smyth, 1; Mrs. L. Deering, 2. Pullet: Mrs. R. Seckold, 1; Mrs. L. Deering, 2. Any other variety, cock or cockerel: G. F. Burrows, 1; Adelaide Poultry Yards, 2. Hen or pullet: G.

F. Burrows, 1; Mrs. R. Seckold, 2. Plymouth Rock—Cock: W. Padbury, 1 and 2. Hen: W. Padbury, 1; G. D. Robinson, 2; W. Padbury, 3. Pullet: W. Padbury, 1 and 2. Leghorn—Brown cock: G. F. Burrows, 1. Brown hen: G. F. Burrows, 1; S. Devenish, 2. Brown pullet: J. Cameron, 1. White Cock: W. E. Newman, 2; W. J. Fist, 3. White cockerel: G. F. Burrows, 1; J. Beckett, 2. White hen: C. and F. Mason, 1; G. F. Burrows. 2. White pullet: A. T. Cuddihy, 1; W. H. James, 2. Any other variety, cock or cockerel: G. Allman, 1. Any other variety, hen or pullet: G, Allman, 1. Langshan—Cock: G. Lohr, 1; W. J. Smyth, 2. Cockerel: W. Padbury, 1. Hen: W. J. Smyth, 1. Pullet: W. Padbury, 1 and 2. Orpingtons—Black rose-comb cockerel: W. Padbury, 1 and 2. Hen: W. Padbury, 1; Mrs. L. Deering, 2. Pullet: W. Padbury, 1 and 2. Black, single-comb cock: Mrs. L. Deering, 1; H. Stinton, 2. Cockerel: Mrs. L. Deering, 1; W. Padbury, 2. Pullet: Mrs. L. Deering, 1 and 2. Buff, single comb, cock: W. Padbury, 1; W. Black, 2. Cockerel: W. Padbury, 1; W. J. Smyth, 2. Hen: W. Black, 1; W. Padbury, 2. Pullet: W. Padbury, 1; W. J. Smyth, 2. Minorca cock: E. C. Kelly, 1. Cockerel: H. J. Easy, 1; Adelaide Poultry Yards, 2. Hen: H. J. Easy, 1; R. A. Dusting, 2. Pullet: W. H. James, 1 and 2. Andalusian cockerel: G. A. Hurd, 1. Hen: G. A. Hurd, 1 and 2. Pullet: G. A. Hurd, 1 and 2. Any other variety fowl: Cairns Candy, 1; W. Black, 2. Pair Guinea fowls: W. Padbury, 1 and 2. Aylesbury drake: Mrs. Deering, 1; W. Padbury, 2. Aylesbury duck: Mrs. Deering, 1; W. Padbury, 2. Pekin drake: Adelaide Poultry Yards, 1; F. W. Reed, 2. Pekin duck: F. W. Reed, 1; Adelaide Poultry Yards, 2. Rouen drake: W. Burton, 1. Any other variety ducks: T. P. Simpson, 1. Geese (Toulouse): W. Padbury, 1 and 2; T. S. Dunckley, 3. Geese (any other variety): W. Padbury, 1. Turkey, American bronzewing, cock: W. Padbury 1 and 2. Hen: W. Padbury, 1 and 2. Best breeding pen: J. C. Skull, 1; Mrs. Deering, 2; W. Padbury, 3. Indian Runner drake: C. W. Johnston, 1; Adelaide Poultry Yards, 2; C. and F. Mason, 3. Duck: Adelaide Poultry Yards, 1; Mrs. Deering, 2 and 3. Pen of five young geese: W. Padbury. Heaviest bird: R. Taylor, 1; W. Padbury, 2 and 3.

Special Prizes.—Golden Wyandotte, cock or cockerel: W. Padbury; silver Wyandotte, cock or cockerel: P. D. Sullivan; white Leghorn, cock or cockerel: G. F. Burrows; Orpington, buff, cock or cockerel: W. Padbury; Orpington, black, single comb, cock or cockerel: Mrs. L. Deering; Langshan, cock or cockerel, W. Padbury; Plymouth Rock, cock or cockerel: W. Padbury; Minorca cock or cockerel: H. J. Easy; geese, best pair: W. Padbury; turkey, cock: W. Padbury; Aylesbury, drake: Mrs. L. Deering; Pekin, drake: Adelaide Poultry Yards; Wyandotte, any other breed, cock or cockerel, G. F. Burrows; Leghorn, brown, cock or cockerel: G. F. Burrows; Dorking, cock or cockerel: W. J. Smyth; Hamburg, cock or cockerel: Mrs. L. Deering; Wyandotte, golden, hen or pullet: Mrs. Seckold; Wyandotte, silver, hen or pullet: W. J. Smyth; Leghorn, white, hen or pullet: C. and F. Mason; Orpington, buff, hen or pullet: W. Padbury, Langshan, hen or pullet: W. J. Smyth; Plymouth Rock, hen or pullet: W. Padbury; Minorca, hen or pullet: W. H. James.

FARM PRODUCE.

Wheat, 1 bushel: F. and C. Piesse, 1; A. Gregson and J. M. Carroll (equal), 2; W. Padbury, 3. Barley, malting: J. M. Carroll, 1. Barley, Cape: W. Padbury, 1; A. Gregson, 2. Oats, Algerian: J. M. Carroll, 1; A. R. Adam, 2; A. Gregson, 3. Mangolds, 12: G. D. Robinson, 1; W. E. Newman, 2 and 3; Swedes, 12: W. E. Newman, 1; G. D. Robinson, 2; W. Marsh, 3. Flour, 200lbs.: F. and C. Piesse, 1; A. Clinch, 2; Peerless Roller Flour Mill, 3. Bran, 1 bag: Peerless Roller Flour Mill, 1. Pollard, 1 bag: Peerless Roller Flour Mill, 1. Pumpkin (cattle): C. Harper. 200lbs. flour, from wheat grown in State: F. and C. Piesse.

DAIRY PRODUCE.

Fresh Butter, 3lbs.: John J. Partridge, 1; Mrs. Von Doran, 2. Butter, bulk (56lbs., in export case): John J. Partridge, 1; T. Hayward, jun., 2.

Hen eggs, one dozen: H. Gardiner, 1; B. F. Piaggio, 2. Duck eggs, one dozen: W. Matthews, 1.

FRUIT AND VEGETABLES.

Fruit (grown in Western Australia).—Oranges: R. Urch, 1; Illawarra Orchard Co., 2. Naval oranges: Wedge and Harper, 1; Illawarra Orchard Co., 2. Mandarines: W. T. Mason, 1. Lemons: Illawarra Orchard Co., 1; R. Urch, 2. Loquats: G. W. R. Wellman, 1; G. D. Robinson, 2. Cape gooseberries: W. Wellman, 1; J. Schmitt, 2. Strawberries (Edith): R. Urch 1; J. Schmitt, 2. Strawberries, any one variety: W. T. Mason, 1. Passion fruit: F. Piaggio, 1. Apples (dessert): Illawarra Orchard Co., 1; Mrs. M. Jacoby, 2. Cooking: Illawarra Orchard Co., 1 and 2.

Dried fruits produced in Western Australia.—Loose raisins: W. Padbury.

Vegetables.—Carrots, shorthorn: F. N. Howell, 1; W. H. Anderson, 2; Beet, red (Globe): W. H. Anderson, 1. Beet, other: W. E. Newman, 1: W. H. Anderson, 2. Pumpkins, bugle: Chas. Harper, 1. Pumpkins, other. C. Harper, 1. Beans, broad: C. Harper, 1; F. N. Howell, 2. Salad vegetables: W. E. Newman, 1. Swedes: F. N. Howell, 1; G. D. Robinson, 2. Lettuce, cos: F. Piaggio, 1; W. E. Newman, 2. Lettuce, other: E. Jones, 1; F. N. Howell, 2. Cauliflowers: F. Piaggio, 1; E. Jones, 2. Onions, green: E. Jones, 1; F. N. Howell, 2. Garlic: C. Harper, 1. Potatoes, collection of two varieties: E. Jones, 1; F. N. Howell, 2. Potatoes, any variety: F. N. Howell, 1; Green peas, two gallons: F. N. Howell, 1; L. Carson, 2. Asparagus: Mrs. M. Jacoby, 1; C. Harper, 2. Radishes: F. Piaggio, 1; W. E. Newman, 2. The Symonds prize for the best collection of vegetables (not less than six varieties): W. E. Newman, 1.

INDUSTRIAL.

Collection of Jams: Mrs. M. Jacoby. Home-made bread: J. A. Minchin, 1; Mrs. M. Jacoby, 2. Sample of Colonial ale: H. M. Beigel, 1; Gracie and Waikley, 2. Sample of Colonial porter: H. M. Beigel, 1; Gracie and Waikley, 2. Collection of pottery: Turton and Piercy, 1; Kirton Patent Pottery, 2. Machine-made bricks: Turton and Piercy. Bread (three loaves) from Padbury's Peerless flour: J. S. Milne, 1; M. Meagher, 2; special prize, J. A. Minchin.

AGRICULTURE.

Italian queen and progeny: Mrs. F. J. Hilton, 1. Queen and progeny, bred in the State, shown in observatory hive: Mrs. F. J. Hilton, 1; C. and A. H. Smith, 2. Observatory hive of modern construction, with bees at work: Government Industrial School, 1; Mrs. F. J. Hilton, 2. Beehive, including frames, and ready for use: Government Industrial School, 1. Extracted honey (liquid or clear): C. and A. H. Smith, 1; W. J. Fist, 2. Granulated honey: C. and A. H. Smith, 1; J. B Kline, 2. Six sections of comb honey: C. and A. H. Smith, 1 and 2. Chunk honey: W. J. Fist, 1; C. and A. H. Smith, 2. Honey vinegar, one gallon: J. B. Kline, 1. Comb foundation (made in the State): C. and A. H. Smith, 1. Natural yellow wax; J. B. Kline, 1. Collection of fancy products; Mrs. F. J. Hilton, 1; C. and A. H. Smith, 2. General exhibit (including bees, honey, wax, hives, tools, appliances, and products pertaining to bee-keeping); J. B. Kline, 1.

CARRIAGES AND HARNESS.

The following is the prize-list for carriages and harness:—

Carriages.—Single buggy, with hood: D. White and Co., 1 and 3, Bowra and O'Dea, 2. Double buggy, without hood: D. White and Co., 1. Double-seated wagon, express or otherwise: Bowra and O'Dea, 1; D. White and Co., 2. Single buggy of any description, to be shown in bare wood and iron: D. White and Co., 1. Farm wagon, to carry not less than two tons: Howard Bros., 1. Dray: C. Glaser, 1; J. Rhodes, 2. Order cart, butcher or milkman: D. White and Co., 1; Robert Cockburn, 2. Sulky: Bowra and O'Dea, 1; D. White and Co., 2 and 3. Spring dray: J. Rhodes, 1. Phaeton sulky: R. Cockburn, 1; Bolton and Sons, 2. Dog-cart: Bolton and Sons, 1; D. White and Co., 2 and 3. Phaeton, with or without hood: D. White and Co., 1 and 3; R. Cockburn, 2. Single lorry: J. Rhodes, 1 and 2. Baker's cart: D. White and Co., 1; R. Cockburn, 2. Squatter's express or batten-side: D. White and Co., 1, 2, and 3.

Harness.—Set buggy harness: Robert Smith and Co., 1. Set spring-cart harness: Robert Smith and Co., 1. Stock saddle: Robert Smith and Co., 1. Gent's ordinary saddle: Robert Smith and Co., 1. Gent's exercise saddle: Robert Smith and Co., 1.

MILKING COMPETITION.

Judge: Mr. R. E. Weir.

Heaviest milking cow: J. Von Ooran (24lb. 14oz.), 1; Cockram and King (24¾lb.), 2; G. W. Hitching (24½lb.), 3. Cow producing the greatest quantity of butter at one milking, as indicated by the Badcock test: J. Von Ooran, 1; G. W. Hitching, 2.

BUGGY AND CARRIAGE HORSES, HACKS, PONIES, ETC.

Judges: Messrs. J. H. Ogborne and J. R. McKenzie.

Horse in single harness, 15·2 or under: J. Stuart, 1; Dr. McWilliams, 2. Horse in single harness, to be driven: J. Stuart, 1; Dr. McWilliams, 2. Pair horses (mares or geldings), 15·2 or under: Thos. Hooper, 1. Single carriage horse, 15·3 hands or over: T. W. Hardwick, 1; H. Hummerston, 2. Pair carriage horses, 16 hands or over: S. R. Emanuel, 1; S. Stubbs, 2. Trotter, to be driven, judged for pace, style, and action: T. O'Beirne's "Kismet" 1; Mrs. W. Dempster's "Dosey," 2. Trotter, to be ridden or driven, for pace: J. White, 1; T. O'Beirne, 2. Gentleman's hack, to be ridden, carrying not less than 11·0: H. D. Waldeck, 1; J. Hoar, 2. Gentleman's hack, to be ridden, carrying not less than 13·0: Col. Ricardo, 1; F. C. Thomas, 2; H. H. Stinton, 3. Lady's hack, to be ridden by a lady: F. C. Thomas, 1; J. H. Waldeck, 2; L. Clarkson, 3. Lady's riding turnout: Miss Patterson, 1. Pony, not over 14·2, to be driven: R. Hummerston, 1; J. Nicholls, 2. Lady's hunter, to be ridden over a series of small brush hurdles: F. C. Thomas, 1; L. Clarkson, 2. Hunter, to carry not less than 11·0, and to be up to that weight with hounds; to be tried over a series of hunting fences: J. Clarkson's "Lang Syne," 1; S. R. Barkclay's "Pusher," 2. Pony, not over 10·2, to be ridden or driven: C. Briggs, 1; J. Nicholls, 2. Pony, not over 12·2, to be ridden or driven: T. C. Kinninment, 1; J. Robinson, 2. Smallest pony on the ground: J. Nicholls, 1. Private turnout, including pony not to exceed 14·2, cart, harness, etc.; to be driven by a lady; judged for excellence of driving, and general neatness, appearance, and soundness of turnout: Jas. Nicholls, 1; E. H. Stirling, 2. Turnout, licensed hansom cab, horse, and harness: J. W. Crossdale, 1. Turnout, licensed wagonette, horse, wagonette, and harness: J. W. Crossdale, 1.

MURRAY HORTICULTURAL SOCIETY.

The spring show of the Murray Horticultural Society was held at Pinjarrah on October 24th.

The Society, which is confined to the gentler sex, was inaugurated 14 years ago, and since that time it has enjoyed an uninterrupted period of activity—an activity which bi-yearly makes the Society the centre of interest in Pinjarra. During its existence it has promoted no fewer than 27 half-yearly shows, the last of which was held in the Pinjarra Mechanics' Hall on the above date. The following is the prize list:—

VEGETABLES.

Best collection: Mrs. Salter (and special). Best six kinds: Mrs. Salter. Asparagus: Miss Murray. Beetroot: Mrs. Salter, 1; Mrs. Farmer, 2. Broad beans: Mrs. Salter, 1; Mrs. Fawcett, 2. Carrots: C. Salter, 1; Mrs. R. Cooper, 2. Cabbage: Mrs. Sutton, 1; Mrs. Braidwood 2. Silver beet: Mrs. Braidwood. Lettuce: Mrs. Fawcett. Onion: Mrs. Salter. Pumpkins: Mrs. Salter. Peas: Mrs. Cuthbert, 1; Mrs. Wigley, 2. Eschalots: Mrs. Salter, 1; Miss Polaine, 2. Turnips: Miss McLarty. Potatoes: Mrs. Salter, 1; Mrs. Cummings, 2. Kohl rabi: Mrs. Braidwood. Swede turnips: Mrs. Salter, 1; Mrs. Sutton, 2; Parsnips: Mrs. Salter, 1. Collection of Salads: Mrs. Fawcett.

FRUIT.

Best collection: Mr. Alderson, 1; Mrs. Fawcett, 2. Loquats: Mrs. Sutcliffe, 1; Miss McLarty, 2. Oranges: Mr. Alderson, 1; Mrs. Fawcett, 2. Strawberries: Miss Ede. Passion fruit: Miss Ede, 1; Mrs. Braidwood, 2. Dried Fruits.—Best collection: Miss Alderson. Dessert raisins: Mrs. Salter, 2. Pudding raisins: Mrs. Salter, 2. Candied fruits, best collection: Miss Alderson.

JAM, ETC.

Best six kinds: Mrs. Thomas, 1; Mrs. Dallas, 2; Miss Alderson, 3. Jelly: Mrs. Dallas, 1; Miss Alderson, 2. Marmalade: Miss Alderson, 1; Mrs. Dallas, 2; Mrs. Wigley, 3. Pickles: Miss Alderson. Honey: Mrs. Dallas, 1; Mr. Charles, 2.

BREAD.

Miss Jessie Salter, 1; Mrs. Farmer, 2; Mrs. Lane, 3. Scones: Mrs. Farmer, 1; Miss C. Adam, 2.

BUTTER.

Mrs. Dallas, 1; Mr. Ogilvie, 2.

WINE.

White: Mrs. McAtee, 1 and 2. Red: Mrs. Salter, 1; Mrs. Wigley, 2.

TOMATO SAUCE.

Mrs. Salter, 1; Mrs. Thomas, 2. Vinegar: Mrs. Salter, 1; Mrs. Fawcett, 2.

FLOWERS.

Best growing collection: Miss McLarty, 1; Miss Green, 2. Geraniums: Miss McLarty. Fuchsias: Mrs. Cuthbert. Pansies: Mrs. Thomas, 1; Miss Harris and Miss Cuthbert, tie. Petunias: Mrs. A. Harris. Foliage: Mrs. Fawcett. Phlox: Mrs. Harris, 1; Miss Fawcett, 2. Antirrhinum: Mrs. Thomas. Growing single specimens.—Geranium: Miss McLarty. Pelargonium: Miss McLarty. Fuchsia: Mrs. W. Green. Pansy: Mrs. Dallas. Begonia: Miss Pollard. Petunia: Mrs. Cuthbert. Foliage: Miss McLarty. Cyclemen: Miss Alderson. Hydrangea: Miss Beacham. Cut Flowers.—Best collection: Miss Ede, 1; Miss McLarty, 2. Roses: Miss McLarty, 1 and 2; Miss McLarty, 3. Geraniums: Mrs. Fawcett. Pelargoniums: Miss McLarty. Pinks: Frank Green. Cosmos: Mrs. Bates. Bouquets.—In vase: Mrs. Sutcliffe, 1; Mrs. Scott, 2. Bridal bouquet: Miss Gerloff, 1; Mr. Congdon, 2. Hand bouquet: Mr. Congdon, 1; Mrs. Green, 2. Buttonholes: Miss May Fawcett. Rare cut flower: Miss Salter, 1; E. Butcher, 2; W. Cumming, 3. Floral design: Miss Wigley. Lady's spray: Mrs. Lane, 1; Mrs. Wigley, 2. Herbs: Mrs. Fawcett.

Before their return to the city, in the evening, the Ministerial party and other visitors were given an enjoyable trip down the Murray River in Mr. W. Gerloff's steam launch.

TOODYAY AGRICULTURAL SHOW.

The annual show of the Toodyay Agricultural Society was held at Newcastle on the 28th October. The following is the prize list:—

INDUSTRIAL.

Collection of fancy work: Mrs. Elphick, 1; Mrs. Parker, 2. Plain needlework (under 16 years): Miss Elphick, 1; A. Durnan, 2. Plain needlework (under 12 years): M. Somers, 1; D. Head, 2. Collection of fancy work (under 16 years): Connie Ellery, 1; R. Martin, 2. Collection of handicraft (for boys under 16 years): R. Wroth, 1; L. Davey, 2. Single article of boy's handicraft: L. Wroth, 1; N. Somers, 2. Copy book (under 16 years): Miss B. Lloyd, 1; L. Wroth, 2. Exercise book, home work (under 16 years): B. Lloyd, 1; L. Wroth, 2. Map of the Commonwealth: V. Davidson, 1; L. Wroth, 2.

SHEEP.

Merino ram: B. M. Connor, 1; G. T. Wilkinson, 2. Merino ewe: B. M. Connor, 1; Miss M. Dempster, 2. Strong-wool merino ram: Miss M. Dempster, 1; G. T. Wilkinson, 2. Strong-wool merino ewe: Miss M. Dempster, 1; H. W. Clarkson, 2. Merino ram (two-tooth): H. W. Clarkson, 1; B. D. Clarkson, 2. Merino ewe (two-tooth): B. D. Clarkson, 1 and 2. Western Australian bred ram: H. W. Clarkson, 1; C. H. Wilkerson, 2. Western Australian bred merino ewe: H. W. Clarkson, 1 and 2. Lincoln ewe: C. H. Wilkerson, 1 and 2. Shropshire ram: G. T. Wilkerson, 1; V. Hamersley, 2. Shropshire ewe: V. Hamersley, 1. Romney Marsh ram: W. G. Leeder, 1. Romney Marsh ewe: H. W. Clarkson, 1 and 2. Shropshire ram (two-tooth): V. Hamersley, 1; E. D. McDermott, 2. Lincoln ewe (two-tooth): McDonald Brothers, 1 and 2. Shropshire ewe (two-tooth): V. Hamersley, 1. Fat merino wethers: T. H. Wilding, 1. Fat wethers (any other breed): T. H. Wilding, 1 and 2. Fat merino lambs: T. H. Wilding, 1; B. M. Connor, 2. Fat lambs (any other breed): T. H. Wilding, 1 and 2.

FLOWERS.

Cut flowers: Misses T. Dodgan, 1; L. S. Viveash, 2. Wild flowers: Miss Syred, 1; Mrs. Kimberley, 2. Buttonholes: T. J. Dodgan, 1; Miss Elphinck, 2. Bridal bouquet: Mrs. B. D. Clarkson, 1; Mrs. T. J. Dodgan, 2. Cut roses: Mrs. B. D. Clarkson, 1; T. J. Thomas, 2. Pot plants: Mrs. T. J. Dodgan, 1; Mrs. W. A. Demasson, 2. Single plants in pots: Mrs. M. A. Demasson, 1; B. Rumble, 2.

MISCELLANEOUS.

Butter made by separator: Mrs. M. Dempster, 1; B. L. Clarkson, 2. Liquid honey: Mrs. Kimberley, 1. Home-made jams: Miss Demasson, 1; Bessie Wilkerson, 2. Home-made bread: Miss Wilkerson, 1; Bessie Wilkerson, 2. Collection of cakes: Mrs. Kimberley, 1; Mrs. V. Lloyd, 2. One pound of local butter, done up: B. L. Clarkson, 1. Pastry: Mrs. V. Lloyd, 1 and 2.

CATTLE.

Bull, for beef: T. H. Wilding, 1; H. W. Clarkson, 2. Cow, for breeding beef cattle: T. H. Wilding, 1; H. W. Clarkson, 2. Jersey or Alderney bull: A. G. Twine, 1. Jersey or Alderney cow: B. L. Clarkson, 1. Ayrshire cow: C. D. McDermott, 1. Two fat cows: T. H. Wilding, 1. Fat bullock: T. H. Wilding, 1.

WINES.

Dry, red, light: Bull and Stevens, 1; Cooringa Co., 2. Dry, red, full-bodied: Cooringa Co., 1; W. A. Demasson. 2. Dry, red, light (1902 or older): Cooringa Co., 1; Kistner, 2. Dry, red, full-bodied (1902 or older): A. C. Pole, 1 and 2. Dry, white, light (1902 vintage): Cooringa Co., 1; F. Lindsay, 2. Dry, white, full-bodied (1903 vintage): Cooringa Co., 1; W. A. Demasson, 2. Dry, white, light (1902 or older): Cooringa Co., 1; W. A. Demasson, 2. Dry, white, full-bodied (1902 or older): Cooringa Co., 1; E. Kistner, 2. Sweet red (1903 vintage): W. A. Demasson, 1; C. J. Lloyd, 2. Sweet red (1902 or older): W. A. Demasson, 1; Cooringa Co., 2. Sweet red (1903 vintage): W. A. Demasson, 1; Cooringa Co., 2. Sweet white (1902 or older): W. A. Demasson, 1; Cooringa Co., 2. Sample of wine: Cooringa Co., 1 and 2.

HORSES.

Thoroughbred stallion: W. G. Leeder, 1. Thoroughbred mare: B. M. Connor, 1; E. R. McIntosh, 2. Roadster stallion: J. H. Phillips, 1. Roadster mare: T. H. Wilding, 1; B. L. Clarkson, 2. Draught stallion: B. M. Connor, 1; L. S. Viveash, 2. Draught mare: B. M. Connor, 1; T. H. Wilding, 2. Western Australian bred draught stallion: W. Cousins, 1; C. H. Wilkerson, 2. Western Australian bred draught mare: T. H. Wilding, 1; B. M. Connor, 2. Champion draught mare: Mrs. M. Dempster, 1. Draught yearling colt: T. H. Wilding, 1. Draught yearling filly: T. H. Wilding, 1. Horse for lorry purposes: J. Somers, 1. Lady's hack: L. Clarkson, 1; J. H. Phillips, 2. Gentleman's hack: L. Clarkson, 1; J. H. Phillips, 2. Two horse team (dray): Mrs. M. Dempster, 1; H. Davey, 2. Single-horse dray: H. Davey, 1; J. H. Phillips, 2. Single buggy horse: B. Lacey, 1. Sulky pony: H. Hummerstone, 1; D. McPherson, 2. Trotting pony: D. McPherson, 1; J. Cook, 2. Maiden jumper: D. Clarkson, 1.

AGRICULTURE AND FRUIT.

Bushel wheat: J. Lawler, 1; W. G. Leeder, 2. Bushel Cape barley: C. D. M'Dermott, 1; J. M. Carroll, 2. Bushel malting barley: J. M. Carroll, 1. Bushel brown oats: J. H. Twine, 1; J. M. Carroll, 2. Bag wheaten chaff: J. M. Carroll, 1; W. Cousins, 2. Bag oaten chaff, J. M. Carroll, 1; C. J. Lloyd, 2. Sheaf of wheat: Mrs. M. Dempster, 1; J. M. Carroll, 2. Sheaf of oats: Mrs. M. Dempster, 1; G. T. Wilkerson, 2. Sheaf of Cape barley: B. Pember, 1; John Lawler, 2. Sheaf of English barley: Jeffrey Bros., 1; G. T. Wilkerson, 2. Two sides of bacon: J. M'Manus, 1 and 2. Two hams: J. M'Manus, 1 and 2. One side bacon: J. M'Manus, 1. Table raisins: Mrs. V. Lloyd, 1; Mrs. B. D. Clarkson, 2. Dessert raisins: C. H. Wilkerson, 1; Miss V. Lloyd, 2. Six oranges: C. H. Wilkerson, 1; Mrs. Kimberley, 2. Six lemons: W. A. Demasson, 1; Bull and Stevens, 2. Six apples: Mrs. Kimberley, 1. Dish of loquats: V. Lloyd, 1; J. Cain, 2.

VEGETABLES.

Potatoes.—Early Rose: J. Cain, 1; T. J. Donegan, 2. Beauty of Hebron: J. Cain, 1; M. Doust, 2. Onions: J. Brennan, 1; A. Hutchings, 2. Cabbage: Mrs. Kimberley, 1; B. D. Clarkson, 2. Cauliflowers: Miss Syred, 1; C. H. Wilkerson, 2. Turnips: Miss Robinson, 1; W. G. Leeder, 2. Carrots: Miss Robinson, 1; Mrs. Donegan, 2. Lettuce: Mrs. Kimberley, 1; H. Davey, 2. Beetroot: B. D. Clarkson, 1; Mrs. T. Waters, 2. Peas: W. Hodkinson, 1; Miss Robinson, 2. Broad beans: H. Davey, 1; F. J. Donegan, 2. Collection of vegetables: Miss Robinson, 1; J. Riley, 2.

PIGS.

Berkshire boar: P. W. Reidy, 1; V. Hamersley, 2. Berkshire sow: Mrs. M. Dempster, 1; M. Lloyd, 2. Boar (any other breed): W. H. Scott, 1. Sow and litter: Mrs. Dempster, 1; M. Lloyd, 2.

POULTRY.

Malay game cock or cockerel: W. T. Richardson, 1; J. H. Twine, 2. Malay game hen or pullet: W. T. Richardson, 1 and 2. British game cock or cockerel: R. W. Dennis, 1; J. Currie, 2. British game hen or pullet: R. W. Dennis. Brown Leghorn cock or cockerel: S. G. Meares, 1 and 2. Brown Leghorn hen or pullet: S. G. Meares, 1 and 2. White Leghorn cock: B. L. Clarkson, 2 (no first awarded). White Leghorn cockerel: W. R. Sinclair. White Leghorn hen: A. Cook, 1; B. L. Clarkson, 2. White Leghorn pullet: W. G. Leeder, 1; W. R. Sinclair, 2. Plymouth Rock cock or cockerel: A. Cook. Minorca cock or cockerel: J. Riley, 1; R. W. Dennis, 2. Minorca hen or pullet: J. Riley, 1; T. P. Donegan, 2. Hamburg cock or cockerel: R. W. Denis, 2 (no first awarded). Hamburg hen or pullet: R. W. Dennis, 1 and 2. Silver Wyandotte cock or cockerel: J. A. Wroth. Silver Wyandotte hen or pullet: J. A. Wroth. White Wyandotte cock or cockerel: W. T. Richardson, 1; W. G. Leeder, 2. White Wyandotte hen or pullet: A. Cook, 1; W. T. Richardson, 2. Pair table fowls: W. T. Richardson, 1 and 2. Pekin ducks: S. G. Meares, 1; A. Cook, 2. Aylesbury ducks: W. G. Leeder. Muscovy ducks: A. Cook, 1; B. Pember, 2. Indian runner ducks: S. G. Meares, 1; A. Cook, 2. Geese: C. Cook, 1; B. Pember, 2. Turkeys: C. Cook. Brown Leghorn cock or cockerel (special): S. G. Meares, 2. Brown Leghorn hen or pullet (special): S. G. Meares. Pair silver Wyandottes: J. A. Wroth. White Leghorn cockerel (special): W. R. Sinclair. White Leghorn hen (special): A. Cook. White Leghorn pullet: W. R. Sinclair.

KATANNING AGRICULTURAL SHOW.

Notwithstanding the heavy rains that fell on show day, the Katanning Agricultural Society may be congratulated on the exhibition given to the public on opening day, 28th October. The prize list is as follows:—

SHEEP.

Merino ram, fine wool: Wesley Maley, 1; Holly Bros. 2. Merino ram, showing wool: Warren Bros, 1; Wesley Maley, 2. Fine-wool merino ewe: Holly Bros., 1 and 2. Strong-wool merino ewe: Warren Bros., 1; Holly Bros., 2. Merino ram, under six months: Holly Bros., 1; Warren Bros., 2. Merino ewe, under sick months: Warren Bros., 1; Holly Bros., 2. Five fat merino wethers: Holly Bros., 1. Lincoln ram: Holly Bros., 1 and 2. Lincoln ewe: Holly Bros., 1 and 2. Shropshire ram: F. and B. Crosby, 1; Holly Bros., 2. Shropshire ewe: Holly Bros., 1 and 2. Three fat lambs: Holly Bros., 1 and 2. Three fat wethers: Holly Bros., 1 and 2. Five lambs of Shropshire strain: Holly Bros., 1 and 2.

HORSES.

Champion draught entire: Clayton and Rintoul, "Prince Royal," 1; Holly Bros., "Nonsuch," 2. Western Australian bred: H. V. Piesse, 1; Holly Bros., 2. Champion mare: Clayton and Rintoul Bros., 1; Geo. Old, 2. Mare, in foal, and foal at foot: W. C. A. Quartermain. Western Australian bred mare: Shackley and Sons, 1; W. C. A. Quartermain, 2. Yearling colt: Clayton and Rintoul Bros., 1; R. L. Devenport, 2. Two-year-old youngster: C. Wilhelm, 1; W. Cornwall, 2. Four-horse team, Western Australian bred: Holly Bros., 1; T. Garston, 2. Champion four-horse team: F. and C. Piesse. Pair farm horses: Shackley and Son, 1; Holly Bros., 2. Draught gelding: F. and C. Piesse, 1; R. Shackley and Sons, 2. Dray team: Shackley and Sons, 1; Holly Bros., 2. Shod horse: Raymond, 1; A. C. Butler, 2 (shod by J. Martin and Co., Wagin). Groomed horse: Holly Bros., 1; Clayton and Rintoul Bros., 2. Blood horse, entire: Holly Bros., 1; H. J. Quartermain, 2. Blood mare: Holly Bros., 1. Blood animal, bred in southern district: W. Wilcox 1. Mare, suitable for breeding hunter as remounts: Holly Bros., 1; M. O'Neil, 2.

HORSES IN ACTION.

Pair buggy horses: F. and C. Piesse, 1. Pair buggy horses, 14·2 and under: Holly Bros., 1 and 2. Single buggy horse: W. M. Thompson, 1; Hill and Watson, 2. Horses in sulky: J. H. Scott Rogers, 1; A. Keirl, 2. Horse and sulky turnout: A. Keirl, 1; J. H. Scott Rogers, 2. Tradesman's turnout: W. Baker, 1; W. J. Rogers, 2. Lady's hack: H. V. Piesse, 1; W. Cronin, 2. Gentleman's hack, 12st.: A. Nicholson, 1 and 2. Pair of hacks, lady and gentleman: J. F. Harvey, 1; H. V. Piesse, 2. Lady rider: Miss Haddleton, 1; Miss Cronin, 2. Trotting pony, 14·2 and under: R. A. Hamilton, 1; Hill and Watson, 2. Trotting pony, under 13 hands: Holly Bros., 1; Dr. House, 2. Hunter over jumps: Holly Bros, 1; Jno. Holding, 2.

Log-chopping: B. Old, scratch, 1; P. J. Mahon, scratch, 2.

DAIRY CATTLE.

Jersey bull: C. A. Harris. Jersey cow: E. Higgins. Ayrshire bull: Holly Bros. Ayrshire cow in milk: Holly Bros. (17lb.), 1; F. C. Piesse (16½lb.), 2.

BEEF CATTLE.

Shorthorn bull: J. J. Treasure. Shorthorn cow: Holly Bros. Bull (any other breed): P. Cunneen, 1; J. P. Turner, 2. Cow (any other breed): C. A. Harris, 1; F. and C. Piesse, 2. Bull (any breed, under two years): J. J. Treasure. Heifer (any breed, under two years): F. and C. Piesse, 1; E. R. B. Beeck, 2. Fat beast: F. and C. Piesse, 1; Holly Bros., 2.

PIGS.

Berkshire boar: F. and C. Piesse, 1. Sow: F. and C. Piesse 1 and 2. Sow and litter: F. and C. Piesse.

POULTRY.

Pair of turkeys: P. Cunneen. Pair of geese: A. Keirl, 1; P. Cunneen, 2. Ducks: J. D. Smith. Wyandottes: R. E. Spencer. Spanish: M. E. Beeck. English Game: A. F. Cuddihy. Malay Game: A. F. Cuddihy. White Leghorns: A. F. Cuddihy. Brown Leghorns: A. J. Prince, Plymouth Rocks: R. E. Spencer. Andalusians: A. Keirl. Orpingtons: A. J. Prince, 1; A. Keirl, 2. Minorcas: A. Keirl, 1; E. R. Beeck, 2.

GRAIN.

Wheat: A. Prosser, 1; Holly Bros., 2. Cape barley: Meharry and Sons, 2. Malting barley: W. J. Sarre, 1; Meharry and Sons, 2. Algerian oats: Meharry and Sons. Wheaten chaff: J. C. Terlich, 1; F. A. Kunzel, 2. Oaten chaff: F. W. Kowald, 1. Wheaten hay sheaves: T. Norrish, 1; Meharry and Sons, 2. Oaten hay sheaves: Meharry and Sons, 1; F. W. Kowald, 2. Green fodder: Meharry and Sons, 1; F. A. Kunzel, 2. 50lb.-bag W. A. flour: F. and C. Piesse.

DAIRY PRODUCE.

Fresh butter (14lb.): Mrs. M. Sounness, 1; M. B. Taylor, 2. Fresh butter (2lb.): Mrs. Sounness, 1; F. T. James, 2. Two hams: C. Severin, 1; F. and C. Piesse, 2. Side of bacon: F. and C. Piesse and R. Gell. Roll of bacon: F. Kunzel, 1; F. and C. Piesse, 2. Dozen heaviest hen eggs: R. E.

Spencer, 1; A. Keirl, 2. Dozen hen eggs (uniformity and weight): T Norrish, 1; Hill and Watson, 2. Dozen duck eggs: J. P. Turner.

VEGETABLES.

Potatoes (28lb.): Meharry and Sons, 1; M. Beeck, 2. Cabbage: J. C. Terlich. Lettuce: J. C. Terlich. Carrots: C. Severin. Parsnips: C. Severin. Swede turnips: E. Ford. Green peas: M. Beeck, 1; E, Ford, 2. Collection of six varieties of vegetables· F. A. Kunzel, 1; J. H. Webse, 2. Collection of vegetables: Geo. Hollingbery.

FLOWERS.

Six cut flowers: Miss Houston, 1; Miss B. Vanzuilicom, 2. Centre bouquet (best arranged): Mrs. Lebad, 1; Mrs. Houston, 2. Hand bouquet: Holly Bros., 1 and 2. Hand bouquet of wild flowers: F. Wilson, 1: H. M. Sounness, 2. Three buttonholes: Holly Bros., 1; M. Lebad, 2. Collection of wild flowers: Miss M. Cronin. Floral design in wild flowers: Geo. Hollingbery. Collection of roses: W. Meharry.

HOME PRODUCE.

Home-made bread: Mrs. E. R. B. Beeck, 1; Mrs. C. A. Quartermain, 2. Roll: Mrs. Wood, 1; Mrs. Lebad, 2. Dried raisins: R. Gell, 1; J. C. Jennings, 2. Scones: Miss Johnson, 1; Miss Munro, 2. Collection of jams and jellies: Miss H. M. Sounness, 1; Holly Bros., 2. Jar of jam: Mrs. E. L. Chipper, 1; Holly Bros., 2. Melon Jam: Mrs. Prosser, 1; M. Jones, 2. Jelly: Holly Bros, 1 and 2. Jar of honey: F. and C. Piesse, 1; F. A. Kunzel, 2.

INDUSTRIAL.

Fancy needlework: Miss F. Wilson, 1; E. Baker, 2. Plain hand needlework: Mrs. Pemble. Knitted hand-made wool stockings: Mrs. R. Patterson, 1; Miss E. Mason, 2. Neatly-patched garment: L. Terlich. Table centre: Miss F. Wilson. Crochet work: Mrs. Lebad, 1; Miss L. Patterson, 2. Fancy cushions: Mrs. W. Pemble, 1; A. M. Simpers, 2. Tea cosy: Mrs. W. Pemble. Washed and ironed shirt: Mrs. F. W. Kowald, 1; Mrs. Hollingbery, 2. Child's floral design in wild flowers: Henry Wood. Child's collection of wild flowers: J. C. Jennings, 1; Henry Wood, 2.

EDUCATIONAL.

Map of British Islands: T. Cook. Map of Western Australia: O. Terlich, 1; C. Newton, 2. Ornamental entry: B. Harris, 1; E. Beeck, 2. Do., Standard 2 to 4: D. Couchman, 1; J. Jennings, 2. Sewing garment: E. Hill, 1; B. Cook, 2. Do., Standard 2 to 4: Georgina Longmire, 1; M. Farmers, 2. Freehand drawing: R. Scott, 1; C. Pembel, 2. Do. Standard 2 to 4: Stanley Turner. Brush drawing: C. E. Harry, 1; R. Turner, 2. Do. Standard 2 to 4: R. Meagher, 1; Laura Quartermain, 2. Clay modelling: E. Beeck, 1; R. Turner, 2.

WOOL.

Two fleeces fine merino: A. M. Nicholson, 1; Warren Bros., 2. Two fleeces strong merino: Warren Bros., 1; Holly, Bros., 2. Two fleeces long wool: A. M. Nicholson, 1; Holly Bros., 2.

DOGS.

Collie: M. Hubbing, 1; F. A. Farr, 2. Kangaroo: F. W. Kowald. Irish setter: R. Scott. Fox terriers: J. Scott Rogers. Spaniel: W. C. Walker. Sheep dog: Holly Bros., 1. Dog or slut (any other variety): T. Houston.

MACHINERY.

(Certificates only.)

Binder: C. R. Knight. Jones's lever-plane chaffcutter: F. and C. Piesse. Horse-works: F. and C. Piesse. Stripper: F. and C. Piesse. Damp-weather stripper: C. R. Knight. Harvester: C. R. Knight. Winnower: F. and C. Piesse. Stump-jump plough (multi-furrow): F. and C.

Piesse. Stump-jump plough: F. and C. Piesse. Cornerusher: F. and C. Piesse. Scuffler: F. and C. Piesse. Disc harrow: F. and C. Piesse. Portable oil engine: F. and C. Piesse. Earth scoop and dam plough: F. and C. Piesse. Garden plough: F. and C. Piesse. Leader: F. and C. Piesse.

VEHICLES.

Made in W.A., at Wagin: A. W. Richter, 1; G. A. and D. Wilson, 2. Hay trolly: Holly Bros. (certificate only . Double-seated buggy: A. W. Richter, 2. Sulky: Daniel White and Co., 1; A. W. Richter, 2.

MISCELLANEOUS.

Tanks and Ironware: Geo. Saunders.

Saddlery Collection: J. C. Nenke.

Side-saddle: Tratham Bros., 1; J. C. H. Nenke, 2.

Single-buggy Harness: P. A. Beeck.

Lady's Harness: P. A. Beeck.

Shaft Harness: P. A. Beeck.

NARROGIN-WILLIAMS AGRICULTURAL SOCIETY.

THE ANNUAL SHOW.

The Narrogin-Williams agricultural show was held on the 3rd inst. in the presence of a large attendance. Notable among the exhibits were the dairy produce, cattle, sheep, and the greatly improved class of horses. The following is the prize-list:—

Best draught stallion in the district: Messrs. Clayton and Rintoul Bros. (Prince Royal), 1. Western Australian bred draught stallion: Mr. Brown (Little Jim), 1. Draught brood mare, with foal, and draught mare: Messrs. Clayton and Rintoul Bros., 1. Four horses in wagon: Mr. Potts, 1. Two-year-old draught colt: Messrs. Clayton and Rintoul Bros., 1. Pair of farm horses: Mr. Potts.

Two bushels of wheat, four bushels of Algerian oats, one bag of oaten chaff, and best collection of farm, dairy, and garden produce: Mr. A. H. Treford, first for each. Best collection of fodder plants: Mr. W. Graham, 1. Wheaten hay: Mr. McCracken, 1.

Educational competitions: Narrogin school, 11 firsts and 14 seconds; Cuballing school, 8 firsts.

Fresh butter: T. H. Lucas.

Bacon: A. Rewell, 1.

Home-made bread: Miss A. Lange, 1. Home-made cakes: Mrs. Bushalla, 1. Scones: Miss Venn, 1. Home-made jam: Mrs. Street, 1. Home-made jelly: Mrs. Lucas, 1. Collection of jams: Mrs. Trefort, 1. Scones (girls): Ida Street, 1. Victoria sandwich (girls): Elsie Street, 1. Tomato pickle and tomato sauce: Mrs. W. F. Wiese, 1. Collection of biscuits: Miss H. C. Clayton, 1.

Champion blood entire: Mr. T. Cornwall (Lapillan), 1. Champion blood brood mare: J. Chipper, 1. Two-year-old blood filly and yearling filly: Mr. J. Chipper, 1. Twelve-stone hack: Mr. Watts, 1. Ten-stone hack: Mr. Hamersley, 1. Ladies' hack: Mrs. Perkins, 1. Pony hack: Mr. Blyth, 1. Single harness horse: Mr. T. Harkness, 1. Hunter, ridden by Mr. J. Livelong, 1. Pair of buggy horses: Mr. T. Harkness, 1.

Jersey bull: Mr Graham, 1. Jersey cow: Messrs. Clayton and Rintoul, 1. Jersey heifer: Mr. M. Brown, 1. Ayrshire cow, Mr. Brown, 1. Ayrshire bull: Mr. Bushby, 1. Ayrshire heifer: Messrs. Clayton and Rintoul, 1. Shorthorn bull (2 years and under): Messrs. Whitford Bros., 1. Fat beast: Mr. E. L. Smith, 1. Shorthorn bull, shorthorn cow, and shorthorn heifer: Mr. J. Chipper, 1.

Merino ram: Mr. Spanswick, 1. Two-tooth merino ram: Mr. J. Martin, 1. Merino ewe: Mr. Fitt. Two-tooth merino ewe: Mr. J. Martin. Fat lambs (shorn): Mr. E. L. Smith, 1. Fat wethers: Mr. E. L. Smith, 1. Lincoln ram and ewe: Mr. Fitt, 1. Leicester ram and ewe: Mr. Fitt, 1. Shropshire ram and ewe: Mr. Cowcher, 1. Romney Marsh ram: Mr. E. L. Smith, 1.

Shearing three sheep: Mr. W. English (17 minutes), 1.

Farm wagon: Mr. T. P. O'Connor, 1. Farm dray: Mr. T. Corbett, 1. Spring dray: Mr. T. Corbett, 1. Double-seated buggy, single-seated buggy and sulky: Mr. J. Mouritz, 1. Stump-jumping plough: Mr. Knight, 1. Reaper and binder and harvester: Mr. Knight, 1. Stripper and winnower: Mr. J. Martin, 1.

Needlewook and flowers: Mrs. Oliver, chief prize winner; Miss Graham, next.

In the poultry sections the chief prize winners were Messrs. Kerile and Pottle and Mr. Saunders.

CANNING AGRICULTURAL AND HORTICULTURAL SOCIETY.

First Annual Show.

Residents of Cannington and the surrounding districts participated in the first annual show, held on the 4th inst., under the auspices of the newly-formed Canning Agricultural and Horticultural Society. The hall in which the show was held was full to overflowing with the rich products of the local soil. These included some samples of grasses over eight feet high. The vegetable and floral exhibits were exceedingly fine, and contrasted favourably with those at some other country shows. The following is the prize list:—

Poultry.

Minorca Cock: H. J. Easey, 1. Minorca Hen: H. J. Easey, 1 and 2; W. D. Pusey, certificate. Andalusian Cock: G. A. Hurd, 1. Andalusian Hen: G. A. Hurd, 1. Indian Game Cock: W. J. Smyth, 1. Orpington Cock: Mrs. Deering, 1; W. Black, 2. Orpington Hen: Mrs. L. Deering, 1; W. Black, certificate; W. J. Smyth, certificate. British Game Cock: W. Black, 1. British Game Hen: W. Black, 1; W. J. Smyth, 2. Bantam Cock: C. Candy, 1; H. J. Easey, 2. Bantam Hen: H. J. Easey, 1. Wyandotte (Silver) Cock: Mrs. Deering, 1; Jas. Crocker, 2. Wyandotte (Silver) Hen: Mrs. Deering, 1; W. J. Smyth, 2. Wyandotte (Gold) Cock: Mrs. L. Deering, 1. Wyandotte (Gold) Hen: Mrs. L. Deering, 1; W. J. Smyth, 2. Best Pair Geese: T. S. Dunkley, 1; D. E. Jackson, 2. Best Pair Turkeys: R. Redman, 1.

HORSES.

Lady's Hack: J. and A. Gibbs, 1 (ridden by Miss Harris); Mrs. Brickman, 2 (ridden by Miss Ethel Price). Gentleman's Hack: J. and A. Gibbs, 1 (ridden by J. Gibbs); J. Dellar, 2 (ridden by S. J. Gibbs). Hunter: J. and A. Gibbs, 1 (ridden by J. Gibbs). Pony (under 14 hands): A. McIntosh, 1 (ridden by A. McIntosh); Stephen J. Gibbs, 2 (ridden by S. J. Gibbs). High Jump: J. Dellar, 1 (ridden by S. J. Gibbs); J. S. Gibbs, 2 (ridden by E. Caporn).

CATTLE.

Best Heifer (under two years): Crane and England, 1; A. E. Brittain, 2; F. B. James, certificate. Milch Cow: J. Gibbs, 1; F. Mason, 2.

VEGETABLES.

Collection Vegetables: A. Butcher, 1; Wm. Gibbs, jun., 2. Broad Beans: W. E. Saw, 1; S. White, 2. French Beans: A. Butcher. Beetroot: A. Butcher, 1 and 2. Cabbage: Jas. Butcher, 1; W. Ball, jun., 2. Carrots: A. Butcher, 1 and 2. Lettuce: W. Ball, jun. Onions: Miss Ousta, 1; Jas. Butcher, 2. Potatoes: F. W. Harris, 1; Jas. Butcher, 2. Green Peas: W. Ball, sen., 1; Albert Butcher, 2. Parsnips: Jas. Butcher, 1 and 2. Special Collection Vegetables Grown from Symonds's Seed: Albert Butcher. Swede Turnips: W. Robertson, 1; J. and A. Gibbs, 2. Turnip (any variety): J. and A. Gibbs, 1; R. E. and A. Cockram, 2. Vegetable Marrows: A. Butcher.

GARDEN FLOWERS.

Collection roses: Jas. Butcher, 1; Mrs. Tims, 2. Champion rose: Mrs. Tims, 1; Jas. Butcher, 2. Best bunch garden flowers: Miss Butterly, 1; Mrs. Hodgkinson, 2. Best gents.' buttonholes: Miss Jean Price, 1; Mrs. Hodgkinson, 2. Best lady's spray: Wilson and Johns, 1; Mrs. Hodgkinson, 2. Best hand bouquet garden flowers: Wilson and Johns, 1; Mrs. Hodgkinson, 2. Wreath garden flowers: Wilson and Johns, 1; Mrs. Hodgkinson, 2. Floral design: Miss Jean Price, 1; Miss A. Cockram, 2.

POULTRY.

Hens eggs (best dozen): G. A. Hurd, 1. Duck eggs: W. J. Smyth, 1; Miss A. Harris, 2. Aylesbury duck: Mrs. Deering. Drake: Mrs. Deering. Pekin duck: T. S. Dunkley. Muscovy duck: Chas. Tolland. Drake: C. Tolland. White Leghorn cock: J. and A. Gibbs, 1; D. P. Caporn, 2. Hen: Mrs. H. Spencer. Brown Leghorn cock: W. Gibbs, 1; J. and A. Gibbs, 2. Hen: Mrs. A. Butterly, 1; W. Gibbs, 2. Black Spanish cock: A. E. Brittain. Hen: Stanley Caris. Plymouth Rock cock: R. Redman, 1; Mrs. Christie, 2. Hen: Mrs. Christie. Langshan cock: Mrs. A. Nash, 1; W. J. Smyth, 2.

CHILDREN'S CLASSES.

Bunch of flowers (child under seven): C. Butterly, 1; A. Jennings, 2. Bunch of flowers (children under 11): F. Spencer, 1; E. Harris, 2. Bunch of flowers (children under 14): D. Caporn. Bouquet wild flowers: C. Ball, 1; H. Gibbs, 2. Orchids: D. Caporn. Everlastings: Ivy Butterly, 1; B. McIntosh, 2. Floral design: Ethel Holt Kangaroo paws: Alice Jennings, 1; H. Gibbs, 2. Map: Maud Tapping, 1; May Denham, 2. Painting in watercolours: Annie Ryde, 1; Maud Tapping, 2.

WELLINGTON AGRICULTURAL SHOW.

The 39th annual show of the Wellington Agricultural and Pastoral Society was held at Bunbury on the 6th instant, when the following prizes were awarded :—

HORSES.

Thoroughbreds.—Stallion : H. W. Venn, " Satanas," 1 ; Locke Bros., " Lockeville," 2. Mare, visibly in foal or with foal at foot : Mrs M. E. Rose, " Albeena," 1 ; Locke Bros., " Duchesse," 2. Colt, two years or under : Mrs. J. S. Gibbs, " Prince Imperial," 1 ; Mrs. M. E. Rose, " Albeenas," 2. Foal or filly, two years or under : J. V. Masson, " Myrtle Brown," 1. Roadsters—Stallion ; H. Wills and Co., " Osterley's Pride," 1 ; G. A. Sutton, " Childe Harrold," 2. Remounts—Mare for breeding for export, visibly in foal or with foal at foot : Locke Bros., " Duchess," 1; W. Ramsay, " Gazelle," 2. Draughts—Stallion : H. Wills and Co., " Prince Albert II.," 1 " S. P. Mackay, " Dalmore," 2. Mare, visibly in foal or with foal at foot : H. Wills and Co., " Heather Bell," 1 ; Mrs. M. E. Rose, " Maude," 2. Dry mare : H. Wills and Co., " Violet," 1 ; W. R. Holmes, " Brown Bess," 2. Colt, two years or under . J. P. O. Wellard, " Coronation," 1. Filly, two years or under : H. Wills and Co., " Merry Maid," 1. This season's foal by Glenmore ; W. Ramsay, 1 ; Mrs. Rose, 2.

CATTLE.

Shorthorn bull ; J. C. Rose, 1 ; E. C. F. Roberts, 2. Shorthorn cow : J. C. Rose, 1 ; H. Wills and Co., 2. Ayrshire cow : Alex. Cameron, 1 ; J. F. Johnston, 2. Jersey bull : J. F. Johnston, 1. Jersey cow : F. Meagher, 1 ; G. C. Rose, 2. Fat beast : H. Wills and Co., 1. Shorthorn bull (W.A. bred), 18 months or under : T. A. Piggott, 1 ; J. C. Rose, 2. Shorthorn heifer (W.A. bred), 18 months or under : J. C. Rose, 1. Jersey heifer (W.A. bred), 18 months or under : H. Wills and Co., 1 and 2. Dexter bull : R. H. Rose, 1. Dexter cow : R. H. Rose, 1 ; Pen of Shorthorn cows (W.A. bred) : T. A. Pigott, 1.

SHEEP.

Merino ram : H. Wills and Co., 1 ; Merino ewe : H. Wills and Co., 1 and 2. Lincoln ram : V. C. Mitchell, 1 and 2. Lincoln ewe : H. Willis and Co., 1 and 2. Leicester ram : H. W. Venn, 1. Leicester ewe : H. W. Venn, 1. Shropshire ram ; G. R. Rose, 1 and 2. Shropshire ewe : J. P. O. Wellard, 1 ; G. C. Rose, 2. Pen of five fat lambs : J. P. O. Wellard, 1 ; H. W. Venn, 2. Pen of five fat wethers : J. P. O. Wellard, 1 ; H. W. Venn, 2. Western Australian Bred Sheep—Merino ram : G. C. Rose, 1. Merino ewe : G. C. Rose, 1. Lincoln ram : V. C. Mitchell, 1. Shropshire ewe, 2-tooth : J. P. O. Wellard, 1 and 2.

POULTRY.

Black Spanish cock or cockerel : W. J. Smythe, 1. Dorking cock or cockerel : W. J. Smythe, 1. Hen or pullet : W. J. Smythe, 1 and 2. Malay Game, cock or cockerel : E. V. Fraenkel, 1. Indian Game, hen or pullet : W. J. Smythe, 1 and 2. Australian Game, cock or cockerel : W. J. Smythe, 1. Australian Game, hen or pullet : M. Veal, 1. English Game, hen or pullet : W. J. Smythe, 1 and 2. White Wyandotte, hen or pullet : W. A. Pratt, 1 and 2. Golden Wyandotte, cock or cockerel : W. J. Smythe, 1; Mackay, 2. Hen or pullet : W. J. Smythe, 1 ; Mrs. Thomas Hayward, 2. Silver Wyandotte, cock or cockerel : W. J. Smythe, 1. Wyandotte, any other colour. cock or cockerel : M. Snowden, 1. Wyandotte, hen or pullet, M. Snowden, 1. Plymouth Rock, cock or cockerel : W. J. Harrington, 1. Hen or pullet : W. J. Harrington, 1. Brown Leghorn, cock or cockerel : W. Snowden 1 ; C. W. Daws, 2. Hen or pullet : C. W. Daws, 1 and 2. White Leghorn, hen or pullet: W. J. Fist, 1 and special; A. F. Spencer, 2. Langshan, hen or pullet: W. J. Smythe, 1 and 2. Andalusian, cock or cockerel; E. Brittain, 1. Hen or pullet: E. Brittain, 1. Black rose-comb Orpington, cock or cockerel: Mrs. McKay, 1. Orpington, single comb, cock or cockerel: W. J. Smythe, 1 and special; A. B. Perrin, 2. Hen or pullet: Mrs. W. S. Hales, 1; W. J. Smythe, 2. Minorca, cock or cockerel: W. J. Smythe, 1. Hen or pullet: W. J. Smythe, 1; F. J. Hamilton, 2. Bantam, black-red cock or cockerel; H. Prosser, 1; W. Walker, 2. Hen or pullet: W. Walker, 1 and 2. Selling class, price not to exceed 30s.: W. A. Pratt, 1. Black Hamburg, cock or cockerel: Mrs. J. Briese, 1. Hen or pullet: W. J. Harrington, 1; M. Veal, 2. Collection of fowls: W. A. Pratt, 1; G. G. Gibbs, 2. Pair of table fowls: A. D. Temple, 2. Pekin duck: F. J. Hamilton, 1 and 2. Toulouse gander: F. J. Hamilton, 1. Toulouse goose: F. J. Hamilton, 1. Turkey cock: R. Houghton, 1 and 2.

AGRICULTURAL PRODUCE, ETC.

Wheat: J. Gardiner, 1 and 2 Barley: J. Gardiner, 1. Oats: J. Adams, 1. Bag of chaff: J. Fletcher, 1; J. Gardiner, 2. Bag of potatoes: T. Hastie, 1; W. T. Mason, 2. Six Swedes: S. H. Fry, 1. Six mangolds; Mrs. H. E. Reading, 1; S. H. Fry, 2. 56lb. box of butter: M. W. Clifton, 1: Jas. McFarlane & Co., 2; J. E. M. Clifton, 3. 1lb. rolls of fresh butter; Mrs. E. Wright, 1; G. J. B. Clifton, 2; A. F. Clifton, 3. Ham: Geo. Rich, 1. Dozen of hen eggs: Mrs. John Moore, sen., 1. Hive of working bees: J. A. Ayre (31lbs.), 1. Sections of comb honey: M. W. Clifton, 1 and 2. Sample of honey: W. J. Fist, 1 and 2.

VEGETABLES.

Collection of Vegetables (not less than six varieties): Mrs. S. MacKay, 1: W. B. Armitage, 2. Two varieties of potatoes: E. Jarvis, 1; Rodger Bros, 2. Cabbage: Geo. R. Teede, 1; Mrs. H. E. Reading, 2. Green peas: E. Jarvis, 1; T. H. Spencer, 2. White turnips: Mrs. H. E. Reading, 1. Carrots: Mrs. H. E. Reading, 1; J. F. Johnston, 2. Beet: E. Jarvis, 1; Mrs. C. Clifton, 2. Lettuce: E. Jarvis, 1; F. H. Spencer, 2. Rhubarb: J. M. Whistler, 1 and 2.

FRUITS.

Oranges: S. H. Fry, 1; Clifton Bros., 2. Lemons: J. M. Whistler, 1; S. H. Fry, 2. Loquats: R. H. Rose, 1; Clifton Bros., 2. Strawberries: W. B. Armitage, 1. Gooseberries: Mrs. John Gardiner, 1 and 2.

INDUSTRIAL.

Loaf of bread: Mrs. Bogue, 1. Scones: A. B. Perrin, 1. Home-made pickles: Mrs. W. S. Hales, 2. Home-made jam: Mrs. C. Clifton, 2. Home-made marmalade Mrs. John Gardiner, 1. Bottled fruits: Mrs. W. S. Hales, 1. Collection of pickles: Mrs. W. S. Hales, 1.

FLOWERS.

Collection of wild flowers: Tonie Anderson, 1. Collection of garden flowers: G. R. Teede, 1; Miss Masson, 2. Hand bouquet: Geo. R. Teede, 1; Miss Masson, 2.

BEE NOTES.

By J. SUTTON.

The present prevailing conditions have brought about quite a new experience to most, if not all, bee-keepers in this State. The long wet, extremely cold winter has very much emphasised what has been urged in this *Journal* from time to time, viz.:—the need of having bees housed in well made and watertight hives; this will be more apparent to those who now find their colonies in a weak state, the cause for this is not far to seek.

First, about the end of August and during September, blossom or natural flora was abundant, and had the appearance of a good spring, so far as the bee-keeper was concerned; but alas! the weather was such that bees could not fly, but were compelled to remain inside their hives and consume the stores; and as this condition continued until almost the end of October, before the bees could fly, the nectar was gone, and but little left available for present use.

Second, bees begin to dwindle and become gradually smaller in numbers, to the consternation of the owner. Under these trying circumstances nothing is left for the owner to do but give food in some shape if he wishes to keep his bees; and this must not be done sparingly, but close attention given to see that they have plenty of stores to enable breeding to be continued. Care should also be taken to remove all frames not covered by the few bees that are left, and more particular care should be taken that any frame that contains pollen, that has become damp and mildewed in the hive, must not only be removed out of the reach of the bee, but they should be melted up; because, if used, worse conditions may result to weak colonies, in the shape of diarrhœa.

Spring dwindling.—Many have endeavoured to explain the cause, and many different reasons are given. There can be but little doubt that if plenty of stores are available and hives are reasonably secure, even with a long severe winter, such as has been our recent experience, there will be very little if any trouble; but, pinched for stores, bees begin to die, and unless seen to at once serious consequences follow. Providing there are enough bees left to keep the brood warm until fine weather prevails, all may be well; but if there is any doubt, better far to double two or more together and make one reasonably strong colony, for the only known sure cure for dwindling is warm weather and plenty of new pollen and new honey. Feeding may stave off for a time, but at best it is only a poor substitute for new honey.

What best to do where dwindling obtains is to keep close watch and remove every frame not required; that is, never leave at this time more frames than there are bees to cover; close up with a division board, and endeavour to help the pets to keep snug and as warm as the conditions will allow.

The strong and vigorous colonies can care for themselves and will give but little, if any, trouble; but once dwindling commences it is not an uncommon thing to find a nice-looking queen one day, and the next time they are examined, even perhaps the next day, she is gone. Queens' cells are started the next thing, but these should in every case be destroyed and the bees at once doubled up with some other weak colony, and closely looked after daily.

So many queries have come to hand regarding the loss of bees, and their present weak condition, that perhaps it were well to give the reason at this point:—Under normal conditions, spring weather being good, brood is present everywhere; in every colony having a good queen every energy seems to be centred to have every available cell filled with brood. Why, may be asked? Because the bees that have come through the winter will not last or live much longer, their end is sure, and unless favourable conditions are obtained and brood-rearing is kept up to replace the old bees as they die, no other result can be expected, dwindling must result, because that condition that prevents the rearing of young brood at the same time hastens the end of the old bees.

Last season some of our neighbouring States lost very heavily, some over 100 per cent. Many and varied reasons have been assigned for the mortality over there, and like many another trouble or disease, we are to a large extent helpless to avert these calamities. However, I hope that we in this State will not have so serious losses, as the weather, I trust, has now become more settled and promising.

Whatever else may be done, or left undone, see that your colonies are strong, that you have a good laying queen, and that they are not at any time short of feed; where weak, keep close watch and remove all extra or useless frames; make your bees as snug as it is possible, and keep a close and incessant watch for robber bees.

Robbing.—This is one of the worst troubles during a trying time like the present. Strong colonies look at all times after No. 1, but when a scarcity of nectar comes, and you commence to feed your weak colonies, care must be taken not to leave these weak colonies unprotected a single moment. Should you do so, and some old stager observes your carelessness, don't be at all surprised to find your weak colony gone on your next visit; for, could your food given to the weak colony be marked, you would find it stored in the strong one, and the other starving, if not already dead.

What to feed.—Not honey, but syrup made with the best sugar and water, in equal quantities, well mixed, and preferably given warm, evenings much better than during the day time, so that it may be removed before the bees are flying next morning.

HONEY FROM CAPPED AND UNCAPPED COMB.

By F. T. SHUTT, M.A., Chief Chemist, Experimental Farms, Ottawa.

The investigation into the nature of honey from uncapped comb—which we have termed here unripe or immature honey—was begun, as some of you will remember, in the season of 1901. Almost at the outset of the work we found difficulty. We endeavoured to determine by chemical means the difference in composition between honey taken from full capped comb and that taken from the comb which was only partially, and that altogether uncapped. I supposed from what I had learned that the difference, if there was any, would be chiefly in the proportion of water held by or contained in the honeys. Consequently, our first endeavour was to make an examination of these three classes of honey in order to get the moisture percentages. That is where our difficulty arose. I found almost at once that our results were extremely variable; that is, by employing the methods of analysis that were then in vogue the data were altogether unreliable. When I attended your convention last year, at Woodstock, I could only present to you data of a tentative character. I could only give indications, and say in which direction I thought our work was pointing; but I was not prepared to say that immature or unripe honey was such and such as regards its moisture content. I did, however, say two things: I stated, or aimed to indicate, that immature or unripe honey contained more moisture, probably between two and five per cent.; and there was another thing I felt pretty certain about, and that was that the published percentages of water in our honey as they had appeared in a Government bulletin some two or three years ago were, unfortunately, unreliable. I remember I went into the discussion rather fully, and gave you the arguments, and my reasons for coming to that conclusion that those results were altogether too high—not all of them, but a very large number of them, were too high in their water content. Of course it was not intentional, as I pointed out at the time. I said the analysts whose work was represented in that report were good and true men, but that the methods which had been employed were not such as would rightly estimate the moisture, and the reason for that was that too high a temperature was being employed: that the high drying temperature really meant decomposition of the honey, and the decomposed products passing off were estimated as water; that is to say, they were recorded as water when they should not have been so.

We discussed somewhat the chemistry of honey. We showed it consisted really of two sugars—dextrose and levulose—and the levulose was the decomposable sugar. After the honey had reached a certain temperature decomposition set in, and the loss had been attributed to water content in the honey. That is the position we were in last year.

Early in the present year I resumed the work with the assistance of Mr. Charron, of the chemical staff of the Experimental Farm, and I am in a position to say, fortunately, that we have been successful in perfecting a method of analysis whereby we could accurately determine the moisture content in honey. I need not go into that matter in detail, because it is really a chemical question. The work was rather a laborious one, and took some two or three months—not all of our time, because I have very little time, comparatively speaking, to devote to this class of work, but nevertheless it spread itself over several months. The results have been published in a paper before the Royal Society, and if any of you are sufficiently interested in it I should be pleased to send you a copy of the paper. I do not now propose to repeat the details of that research, but I may say, briefly, it amounts to this: Instead of drying the honey upon asbestos in the little glass tubes which I showed you last year and drying them in a steam oven at the temperature of boiling water, we are drying upon asbestos or upon sand, and at a very much lower temperature, viz., 60° C. One hundred Centigrade is the boiling point of water. We are also drying in a partial vacuum; the apparatus was improvised in our laboratories. I brought with me a copy of a photograph of the apparatus. At that temperature the honey can be completely dried without entailing any loss through decomposition of levulose. That being so, and all that being very satisfactory, we reverted to our old samples of 1901 and analysed them by this improved method, and upon this chart I have placed the results.

You will remember that among the honeys I brought to the convention last year there were samples from fully capped comb, from partially capped comb, and from comb entirely uncapped. Half the bottles of honey had been kept in the honey-room—that is, above ground—and the duplicates kept in the cellar of Mr. Fixter's house. There was also another feature which had been looked into, and that was the matter of the covering of the bottles. Half the bottles had been closed by glass stoppers, whereas the other half had been closed merely by cheese-cloth; so that we had honey kept in the honey-room upstairs in glass stoppers and cheese-cloth covered bottles, and similar samples kept in the cellar.

(Refers to chart.—Table I.). The first four results are from honey extracted from fully capped comb. The first two represent the honey as kept in the honey-room and cellars respectively in glass-stoppered bottles; the second two represent the same honey kept in the honey-room and cellar in cheese-cloth covered bottles. The date on which the honey was extracted, and the date on which it was analysed, are given. I wish to direct your attention to one or two features without reading too much into my results. In the first place, you will notice that the percentage of water in this ripe or mature honey, as taken from fully capped comb, is somewhere between 15 and 16 per cent.; I do not propose to say that all genuine ripe honey should be between 15 and 16 per cent.; we have not done sufficient work on Canadian honey to make that statement definitely, emphatically, and beyond denial; but I will say this, that during the last two years we have examined a large number of samples, and I have never found any honey with any such percentages as I quoted from that bulletin last year, where the water content went up to 25 and 35 per cent. I do not think that is at all possible in genuine ripe honey. The difference of half a per cent. may be omitted from consideration. There is very little difference between keeping it in the honey-room and in the cellar, and we did not expect very much, because the bottles were closed with glass stoppers. When we come to consider those covered with cheese-cloth, there is certainly in one case a slightly higher percentage of water, and in connection with experiments which we have recently tried in regard to the storing of honey, we shall find an explanation for this fact., viz., that there is slightly more water in honey which is kept in a bottle merely covered by cheese-cloth as compared with honey kept in a hermetically sealed vessel.

TABLE I.—WATER IN HONEY, 1901.

Comb.	Where kept.	Bottle closed with	Date of Extraction.	Date of Analysis.	Water, per cent.
Fully capped ...	Honey-room	Glass stopper	6th Aug.	1st Oct.	15·46
,, ...	Cellar ...	,,	,,	,,	15·89
,, ...	Honey-room	Cheese-cloth	,,	,,	16·95
,, ...	Cellar ...	,,	,,	,,	15·84
Partially capped ...	Honey-room	Glass stopper	1st July	,,	19·12
,, ...	Cellar ...	,,	,,	,,	20·68
,, ...	Honey-room	Cheese-cloth	,,	,,	20·63
,, ...	Cellar ...	,,	,,	,,	21·03
Uncapped ...	Honey-room	Glass stopper	,,	,,	19·57
,, ...	Cellar ...	,,	,,	,,	19·24
,, ...	Honey-room	Cheese-cloth	,,	,,	18·25
,, ...	Cellar ...	,,	,,	,,	22·09

Let us look at the honey from the partially capped comb. You will at once perceive that there is a difference in percentage from that of the fully capped comb. The average of the four results of the latter would be somewhere in the neighbourhood of 16 per cent.; but you notice for the former that the percentage of water varies from 19 to 21, so that the average would be in the neighbourhood of 20 per cent. We find from our improved method of analysis, therefore, a difference, in the season of 1901, of about four per cent. of water more in this partially capped honey than in the fully capped honey. Proceeding, and looking at the honey from the uncapped comb, we find that the water content varies from 19·24 to 22·09, so that the average would be somewhere between

20 and 21. The conjecture in this connection I made last year has been borne out by this chemical analysis, and I am very pleased that we have got such definite results. I wish to say one other thing about this: that not only does the immature honey contain more moisture, making it of poorer quality at the outset, but further, that its keeping qualities are impaired. The honey readily spoils. Honey from uncapped and partially capped combs did not keep so long as that from fully capped comb. In fact, I have never yet found any difficulty in keeping capped honey for any length of time. I was examining a sample of honey 14 or 15 years years old, and it seemed to be just as good, as far as I could judge, as any fresh honey I have examined. But with regard to these immature honeys, I found with the temperature of the laboratory—anywhere between 65 and 70 degrees—that in the course of a few months these honeys began to ferment. Undoubtedly the unripe honey has very poor keeping qualities. This, of course, points to the danger of putting such a honey upon the market, and also to the danger of mixing it with ripe honey. The honey season of 1902 was somewhat different, as you are aware, from the season of 1901. The work, consequently, was duplicated.

I now refer to the figures which we placed upon this second chart (Table II.). There is only this difference, that we have not got the samples kept in the cellar. Half the samples were kept in the laboratory and honey-room, and they are from capped, partially capped, and uncapped combs, as in the year 1901. However, I should say this word about cellars. There are cellars and cellars, and with regard to this one in which Mr. Fixter keeps the honey, it is apparently dry (and dryness is a great factor), or has air almost as dry as that of the honey-room. These results, no doubt, would have been very different if the cellar had been damp, in which the air was moist. That will be very apparent to you when I call your attention to some figures upon this third chart upon the wall. But you must not think, from the results which are placed upon the

TABLE II.—WATER IN HONEY, 1902.

Comb.	Where kept.	Bottle closed with	Date of Extraction.	Date of Analysis.	Water, per cent.
All capped ...	Laboratory	Glass stopper	7th Aug.	6th Nov.	15·78
" ...	Apiary ...	"	"	11th "	15·88
" ...	Laboratory	Cheese-cloth	"	6th "	17·35
" ...	Apiary ...	"	"	11th "	16·25
Partially capped ...	Laboratory	Glass stopper	7th July	6th "	16·58
" ...	Apiary ...	"	"	11th "	15·33
" ...	Laboratory	Cheese-cloth	"	6th "	15·31
" ...	Apiary ...	"	"	11th "	15·90
Uncapped ...	Laboratory	Glass stopper	"	6th "	17·13
" ...	Apiary ...	"	"	11th "	16·33
" ...	Laboratory	Cheese-cloth	"	6th "	17·56
" ...	Apiary ...	"	"	11th "	16·18

1901 chart, that you can keep honey uncovered in a damp cellar as well as you could keep it in a dry atmosphere. That inference must not be drawn from this chart.

In considering capped comb, this honey was extracted, you notice, about the 1st of August, and it was analysed the first week in November—that is to say, three months later. The percentage of water, again, in 1902 was between 15 and 16 per cent. You see how very similar it was to the honey we had in 1901. That bears out my conjecture that the percentage of water in normal ripe honey is somewhere between 15 and 16 per cent. The cheese-cloth covered bottles, you notice, contain slightly more moisture, 17 per cent. in one case and 16¼ in the other case; one kept in the laboratory, the other in the honey-room. What does that mean? It means that the honey attracted moisture from the atmosphere. With regard to the partially capped and the uncapped comb honey, we do not notice that difference observably last year. In 1901 there was something like four per cent., but this year apparently the partially capped comb honey was of a very similar character. The only inference I can draw is that it is likely to vary according to the season. The results in experiments in storage of honey furnishes an explanation for that: it will depend upon the moisture in the atmosphere at the time.

The uncapped comb certainly shows a somewhat higher moisture content; it runs from 16·18 to 17·6 per cent., so that the average per cent. of water in the uncapped comb honey would be between 16 and 17 per cent. There is no doubt as to the better keeping qualities of ripe honey, and the fact that this immature honey will, if it is exposed to anything like a warm temperature, rapidly ferment.

Mr. Lott: Relative to the honey produced in 1901, how do you account for the greater percentage of water in partially capped honey and uncapped?

Prof. Shutt: Practically, it has been due to the character of the season. I have brought the 1902 samples here, and they are numbered so that you do not know their origin; you may probably be able to judge from the appearance which are ripe and which are unripe, and I will tell you afterwards if you have made a correct judgment.

For one or two moments I am going to direct your attention to this Chart (Table III.). The question of the storage of honey is an

Table III.—Experiments on the Storage of Honey, 1902.

		Water, per cent.
	Ripe honey, from capped comb	15·88
A	,, exposed to dry atmosphere 1 month ...	14·24
	,, ,, moist ,, 1 ,, ...	31·46
B	,, ,, dry ,, 20 days ...	13·84
	,, ,, moist ,, 20 ,, ...	43·23

A: Honey placed in glass cylinder.
B: Honey placed in open evaporating dish.

important one, and I expected our work in connection with ripe and unripe honey would throw some light upon it, but in addition to those experiments just detailed I took some honey extracted from fully capped comb, which you will therefore call ripe honey, and I exposed it in a glass cylinder to the atmosphere of the laboratory, which at this time of the year in Ottawa is an exceedingly dry atmosphere. You know that the atmosphere in the winter time is always drier than in the summer time. The higher the temperature the more moisture air can hold. I took some of the same honey, and I exposed it in a similar glass cylinder to a very moist or saturated atmosphere. For this we took a large bell-jar, and placed it in a flat dish of water; then, making a little scaffolding or shelf over it, I placed upon it the honey in this cylinder, and put the bell-jar over the whole thing, and left it in the laboratory at a temperature of, we will say, 70 degrees Fahrenheit, and very soon that air took up as much moisture as it could from this dish of water. The air was saturated with moisture at that temperature. See the result upon the honey. The percentage of water in the original honey, 15·88; that which was exposed to the atmosphere for one month was 14·24. What does that mean? It means that the water has passed off into this dry atmosphere. But honey kept in a moist atmosphere contained 31·46 per cent.: it had doubled its moisture contents.

In the next experiment we exposed a larger surface to the atmosphere, by pouring honey into a flat evaporating dish. You might term it a soup plate. One was kept in the laboratory, exposed to the atmosphere, and the other put under this bell-jar, also holding a vessel containing water. What was the result? In that exposed to the atmosphere we have 13·84 per cent. of moisture; it had lost a little more, as we might easily expect, by being exposed in the open flat dish, than the honey in the glass cylinder. That kept in the open flat dish in this bell-jar, in this moisture-laden atmosphere, contained 48 per cent. of moisture. That was nearly one half of water—more than three times the amount of water that the honey originally contained. I think that is a very valuable result, in indicating the necessity of keeping our honey in a dry atmosphere. This honey, as soon as it had absorbed this water, began to ferment. The spores, which are always present in the air, found a suitable medium in which to develop, and that honey fermented in the course of a very short time.

Mr. McEvoy: Did you test any comb honey on the same plan?

Prof. Shutt: No; our experiments were upon extracted honey. We could not obtain comb that was not unbroken. The experiment would be of no value if the capping were not sound.

Mr. Holtermann: Where the honey was kept exposed there in the winter it got drier, did it?

Prof. Shutt: Yes. The winter atmosphere at Ottawa is very dry; probably much drier than at Toronto.

Mr. **Holtermann**: I think, if I am not mistaken, I asked Prof. Shutt to carry on those experiments some years ago, and I, of course, entirely agree with him. I believe he has done excellent work here. I have been able to get but very few bee-keepers to agree with me in this way of handling honey: that is, when you extract your honey, strain it, put it up in your package, and then close it at once. This idea that in average summer temperature you can dry honey, as it were, and evaporate it, is not correct. I am very much pleased, indeed, that Prof. Shutt, in these experiments, bears that out. You do not alone lose as far as the amount of moisture in honey is concerned, but you lose in the aroma of the honey. I am delighted with the work Prof. Shutt has done, and I think it will be of great value to bee-keepers. And I hope that that will come, not alone before the bee-keepers of the province, but before the consumers and buyers of honey, so that they will value more well-ripened honey, and they will know where to keep it and how to keep it.

Mr. **Morrison**: Do you know whether that honey lost in flavour as it lost in its percentage of water?

Prof. **Shutt**: I am not an expert on that, but you can try that for yourselves. There is a practical part with regard to this matter, especially where honey is used for manufacturing purposes. If you buy a honey with 30 per cent. water you only get 70 per cent. of sugar, and if you buy it with 15 per cent. water you get 85 per cent. of sugar. Therefore, the manufacturer ought to discriminate between the qualities of the honey.

Mr. **Morrison**: Would not that honey with 31 and 43 per cent. of water ferment?

Prof. **Shutt**: That is what I pointed out.

The **President**: Would it be possible that any moisture that collected on the inner side of the bell-jar would drop directly into the honey?

Prof. **Shutt**: That is a very large bell-jar; there is no possibility of anything of that kind.

Mr. **Heise**: Can Prof. Shutt tell us, after a certain quantity of honey has absorbed that extra percentage of water, whether the weight would be increased to the same extent?

Prof. **Shutt**: The weight increases, because we tried it in both ways. I do not know about the bulk; I did not measure it in that sense, but the weight increases directly as the amount of water absorbed is concerned, because there is nothing volatile about the sugars of honey.

Mr. **Darling**: If comb honey is kept in a damp place the honey swells until it touches the cap and produces a dirty appearance. With regard to the matter that is under discussion at the present time, I tested some well-ripened honey a few days ago, and it tested about 14½lbs. to the gallon. I figured out how much water it would take to make honey 13lbs. to the gallon. It takes about 28 per cent. of water. That is, take 100lbs. honey (14½lbs. to the gallon), add 28lbs. of water to it (10lbs. to the gallon), and you still have a honey 13lbs. to the gallon; and the manufacturer who buys the best honey at 10 cents a lb. gets it cheaper than the one who buys the other at eight cents.

Mr. Gemmell moved, seconded by Mr. Holmes, that a hearty vote of thanks be tendered to Prof. Shutt, Mr. Creelman, and Mr. Fixter for the very excellent addresses given, and the assistance they have afforded to this convention, which, on a vote being taken, was declared carried, and the President tendered the vote of thanks to these gentlemen.

The President appointed Messrs. Sparling, Post, and Sibbald as a committee to examine Prof. Shutt's samples.

THE CAUSE AND CURE OF GAPES.

At this season of the year, when there are so many young chickens about, a word with regard to the very important question of gapes will probably prove of use to many readers. Although it is possible for both old and young birds to get this complaint, the trouble mostly arises with the chickens, and it is a thing of very rare occurrence to observe an older bird suffering from it. Gapes is not the cause of so much loss in the poultry yard as was the case some few years ago, but yet in some parts it is exceedingly prevalent, and much loss and trouble are occasioned thereby. A bird suffering from the gapes is easily recognised, as it stands extending its neck, frequently yawning or gaping; a wheezing cough is sometimes noticed, and when there are many worms present the bird will froth at the mouth. If not attended to, the bird will become suffocated and die.

In and upon all warm-blooded animals and birds there are two distinct forms of parasites to be found, the animal and the vegetable. The most troublesome of the latter parasites is "ringworm." From the name one would suppose it was due to a worm, but this is not the case, but to a minute fungus. The disease known as favus, affecting the combs of fowls, is also due to a vegetable parasite. The disease occasioned by the later form of parasite, the animal, are many, the most common, as far as fowls are concerned, at any rate being gapes. It mostly affects birds from one to six months old, although, as already stated, older birds are liable to it. Gapes is due to the presence of animal parasites in the throat of the bird, and are termed "*Syngamus trachealis*," or to gamekeepers the red or forked worm. On examining the trachea and bronchia of a bird showing these symptoms, from three to a dozen, and perheps even more, small red worms will be seen. These are fork shaped, though sometimes straight ones are noticed. The former of these are the copulating males and females. The males are considerably smaller than the females, and they are attached firmly together, so much so that they cannot be separated without tearing the tissues. The ova of the female contains fully-formed embryos, which escape by the rupture or the decay of the parent. They hatch in damp earth or water in from one to six weeks, according to temperature. When they are swallowed by the bird they develop into adults, and are able to produce in their turn in less than three weeks' time. No second host is required. The embryos are able to remain alive in the alimentary canals of earthworms, and these are eaten by the fowls, and this is one way of the disease spreading.

Perhaps one of the most important points in connection with the cure of gapes is that immediately a bird dies it should be burnt, and not merely buried in the ground as is so often the case. As will easily be seen, if the bird is thus treated the parasites are allowed to breed, which they do quickly, and the worms come up to the surface of the ground and are eaten by the chickens. Therefore, as a precaution, always burn the bodies of birds that have died of this complaint. There are many remedies and cures for this disease, if it may be termed thus. One of the oldest, but at the same time one of the most efficacious, is that of soaking the grain in urine before giving it to the birds. The ammonia escaping from the urine proves fatal to the red worms and their embryos. Another old method, but a good one, is that of inserting a feather down the throat of the bird, a feather that has been previously dipped in paraffin oil or turpentine. When down the throat it should be given a sharp turn, and then drawn quickly out, and frequently some of the worms stick to the feather, and are thus extracted.

Another method of cure that has been tried with beneficial results is that of placing in the drinking water a little salicylate of soda, and this addition kills the ova and their embryos. The amount of salicylate of soda is three drachms to every quart of water. Tobacco smoke has also been tried with success. The birds are placed in a box, with no opening, and a quantity of smoke is blown in and the bird placed therein. If the bird remains in for two or three minutes it will have the effect of killing some of the worms. It is not, however, a method to be much recommended. (1.) There are several powders and preparations upon the market that may be used with good results. Most of them consist mainly of finely powdered chalk, and this is blown into a box in which the bird has been previously placed, and in this manner many of the worms are dislodged.

Immediately a bird is seen with the gapes it should be isolated, placed by itself where the other birds cannot come into contact with it. If allowed to remain with the other fowls the trouble will spread to them very speedily.—E.T.B. in the *Canadian Journal of Agriculture.*

THE DAIRY HERD:

Its Formation and Management.

The pursuit of dairy farming depends for its success upon certain fundamental conditions. First, the owner of the business himself, or otherwise the agent or manager who has the immediate control and personal direction of the work, must have a natural fondness for animals, prompting to generous and kind treatment, as well as good judgment in selection, breeding, and care. It is not sufficient that he should be a horseman, or fond of cattle in general; for best results he should have a special liking for the dairy cow, over and above all other animals. Second, the cattle must be good of their kind and of a variety suited to the work. They must be truly dairy cattle; but of this more presently. Third, the farm should be specially adapted to the branch of husbandry in view. A good dairy farm is pretty certain to be good for general farming, but many good farms in general are not suited to dairying. The dairy farm should be carefully selected, all the requirements of the business being well considered. Yet many disadvantages so far as the farm is concerned may be successfully overcome by the skilful dairyman, and dairying in some forms is profitably conducted without any farm, so that this condition, important as it is, can not be regarded as essential. Fourth, it is well to study the character of the accessible markets and the means of communication; location and the line of dairying to be followed may be largely controlled by the markets. In some cases the markets form an essential condition, but modern facilities for transportation make the location of the dairy farm with relation to its markets comparatively unimportant. The first and second above remain as the essential factors—the owner and the cow. Assuming that the dairyman is all he should be, it is proposed to consider in the following pages the dairyman's main stock in trade, upon which depends his success—the dairy herd, its formation and management.

Like almost all other occupations at the present day, dairying has become divided into several distinct and special lines. These differ mainly as to the form of product and the manner of disposing of it. Milk or cream may be produced for delivery to consumers, and this delivery may be direct or indirect. The same products may be delivered to a factory for manufacture into butter or cheese, or the milk product of the herd may be worked up at home and there converted into butter or cheese. The prudent dairyman should first consider which line of business he will pursue. In so doing he must have regard for all his circumstances—the location, markets, farm, buildings, water and ice supply, the labour at his command—and his own preference, and prospects for profit. Upon his decision as to the particular kind of dairying to be followed should depend the character and composition of his herd of cattle.

CATTLE FOR THE DAIRY.

Dairymen are divided in opinion as to the kind of cow which is most profitable. Some prefer a "general-purpose cow," being a member of a specially developed milk-producing family, from one of the beef breeds or grades of such stock. An animal is thus secured which has a large frame, is easily kept in good flesh, and fattens soon when not milking heavily; such an one also has large calves, profitable for veal or for growing as steers. Even if such animals are not so productive while in the dairy, their meat-making proclivities may make up for it. There are two or three of the established breeds of cattle which claim to possess combined qualities for meat and milk. On the other hand, many dairymen (including the writer) prefer cattle of the distinct class or type especially adapted to dairy purposes alone. This class includes various families and breeds, all having the marked characteristics which distinguish the milk-producer. Owners of such cows expect them to be so profitable as milkers that their beef-producing quality and the final disposition of their carcasses may be entirely ignored; and the calves, except so far as wanted to raise for the dairy, are given little consideration. Which of these lines of policy should be pursued every dairyman must determine for himself. To succeed in his business he should select his herd or its foundation with a view to profit. Whether he should buy, breed, and feed his cows, having in view only their dairy products and capacity for reproduction, or whether he will find it more profitable to include the items of beef and veal, must be largely determined by home conditions.

SPECIAL ADAPTATION.

Within the general class of dairy cattle one can find great variety and can therefore select breeds or families well adapted to the special needs in view. Some dairy cattle are noted for the quantity of milk they produce; others for the high quality or richness of their milk, which means butter producers. Some combine quantity and quality in a specially economical way, under some circumstances. There are cows of active habits, which forage well on a wide range of scanty pasture, and will profitably work up the coarser kinds of food in winter. There are others which have proved their capacity for making good returns when more closely confined and subjected to high feeding. Some cows give a great flow of milk for a comparatively short season, and others are noted for an even, steady yield of milk the year through. The dairyman can easily find cattle, therefore, adapted to his particular wants. As a rule the different dairy characteristics named pertain to different breeds, so that every dairyman is likely to find some one breed of dairy cattle better suited to his wants than any other.

This is not the place to revive the never-ended "battle of the breeds." No matter how strong one's convictions, discretion must be exercised. Pronounced opinions and direct advice as to the several recognised dairy breeds are here unnecessary. Evidence abounds on every side, and every dairyman that is, or is to be, can satisfy himself as to the cattle he should adopt, if he will but make a proper study of the subject. He need not go far in this country to find the best kind or breed of cows for milk supply, the best for butter making, or the best for the cream trade. There is no special cheese-making cow; the best butter cow is also the best for cheese. This fact has been demonstrated beyond dispute.

Formation of the Dairy Herd.

There are two very different ways of forming a dairy herd and of maintaining its size and quality. It may be done by buying or by breeding, and these two methods may be combined. The purchasing plan is practised to a considerable extent by those who produce milk for town and city supply. In a few cases it has been known to be successful where the work of the herd was to make butter. Applied in its extreme form, cows are bought when mature and at their prime, judged almost exclusively by their milk yield, are highly fed so as to keep steadily gaining in flesh, and are sold, usually to the butcher, as soon as they cease to be profitable as milkers. The bull may be of any kind so long as he gets the cows in calf, and the calves are valued only as causing "fresh" cows, and are dispensed with as soon as possible. The first modification of this system is to keep extra good cows for several seasons, and the next to raise heifers from some of the best milkers to replenish the herd. This way of making up a herd and keeping good its numbers requires abundant capital and rare judgment in buying and in selling. It cannot be recommended to one lacking experience, and even the shrewdest buyer runs great risk of bringing disease into his herd.

The other extreme is to begin with a few well-selected animals as a foundation, and gradually build up the herd to the size desired by judicious breeding and natural increase. This method takes time, and time which may be money, but it is by far the safer and more satisfactory in its results, and it must be recognised as a higher grade of dairy farming.

A desirable combination, in starting, is to buy the number of cows desired, and good animals of the sort determined in advance. If one's means will permit, include a few superior cows, and a first-class bull at any rate. Let the cows selected be such as have had two calves, and perhaps three, so that they may be judged by their own development and yet be young enough to improve and be in full profit for some years. With a herd thus formed, begin at once the work of improvement by breeding and selection. Sell promptly any cow which proves unsatisfactory and replace her by the best increase of the herd, or purchase occasionally an animal which will raise the average quality.

Pure Bred Dairy Cattle and Grades.

A dairyman can hardly be advised to buy at once a full stock of pure bred cattle of any breed, if his sole object and dependence for profit is to be the dairy product of the herd. Such a venture will necessitate large investment, and should include the breeding of registered animals, for sale at remunerative prices, as a part of the business. Well bred and well selected grade cows, of the line of blood desired, seem to be the most profitable animals for the practical dairyman, or at least the best to begin with. If enterprising and progressive, the owner will hardly be content with grades only. He may begin with only his bull pure bred; presently he will want a registered cow to match, then one or two more. Thus he will be steadily and properly working toward a purely bred herd. If the breed chosen is the right one for the object sought, it will soon be found that the more of this blood the herd contains the better. Starting with half bred cows (the offspring of pure bred bulls and dams of mixed or uncertain blood), the next grade, three-fourths pure, will prove better dairy stock, if the bull is what he should be and the increase has been culled. Another step higher is better still, better for the dairy, and so the grading goes up and improvement goes on until the blood of the herd is practically pure. The best dairy results may thus be reached, but the herd has a taint. It lacks pedigree. Its increase, however excellent in dairy performance, must pass and sell as grades. The owner feels this, and is pretty sure to gradually replace his well bred cows, almost pure bred, with fully pedigreed and registered animals. This end is reached sooner and easier by starting with one or two registered females, and, of course, a registered bull. Moderate investment and the lessened risk of loss in the hands of one unaccustomed to handling registered stock, and finding a market for the surplus, doubtless favour grades for the dairy herd. The argument and the probabilities of success, based upon the fixed principles of breeding, are on the side of pure bred, registered stock. In the hands of experienced men the latter prove the more profitable in actual practice.

In these days any dairyman who wants registered animals of any of the approved breeds can get them if he will but make the effort. The beginner in registered dairy stock cannot be too strongly urged to buy and breed on the basis of individual and family merit and dairy record, and not upon pedigree alone. Pedigree is of value and should be well studied; it is the best guarantee that the calves to come will make good cows. But the pedigree should be supported by uniform excellence in the family and by evidence of merit in the particular animals bought. Although the investment is greater, there is greater certainty of good results if mature cows are bought which show what can be expected of them, if they have not already made a record, than if calves or undeveloped heifers are selected. It is also economy, having chosen the right breed, to purchase good representatives of that breed, rather than be content with only average or even ordinary animals. Successful dairying has proved that the greater profit comes from the best cows, whatever their kind. This is as true of pure bred or registered stock as of common cows. It is better to pay $300 for three excellent cows than to pay the same for four good cows or five which are only fair. A really superior dairy cow of a superior family, with pedigree which gives assurance of calves equal to the dam, if not better, is always worth a large price. Such an animal adds much to the average value of any dairy herd. In buying registered cattle, deal only with men of reputation as breeders and of strict integrity; "the best part of a pedigree is the name of the breeder."

THE BULL AND HIS TREATMENT.

With any dairyman who depends upon breeding and rearing calves for the maintenance of his herd and its improvement, the choice of a bull is a matter of prime importance. The bull is constantly referred to as "the head" of the herd, and that trite saying, "The bull is half the herd," should never be forgotten. Every calf added to the herd takes half its blood from the bull. Often this is the more important half. The bull is always the main dependence for raising the average quality of the herd, and should be chosen with this object in view. This is especially true if the cows are grades and the "grading up" is in progress. The grade dam may be selected and largely relied upon to give size, form, constitution, and capacity of production to her heifer calf; its dairy quality, the inbred power to increase the richness of milk, is derived from the pure bred sire. One cow may prove a poor dam, or fail to breed, and still give a profit in milk. Such a loss is comparatively trivial and the fault easily corrected. But if the bull fails, or proves a poor sire, the entire increase of a year may be lost. In getting a bull, get the best. At least approach that standard as nearly as possible. Make a study of the animal's pedigree and the dairy history of his ancestors, and especially of the females among his nearest of kin. Then see that the good qualities of his progenitors appear to be reproduced in the animal in question. A common error among dairymen is to use immature bulls and to dispose of good ones before their merit as sires has been fairly proven. Bull calves are cheap, and young bulls are considered much easier to handle. But it is good advice to the buyer to purchase a bull of some age, whose progeny prove his value as a breeder, rather than a calf of exceptional pedigree; and to the owner, having a sire of proved excellence, to keep him and use him for years, or as long as he shows himself potent and prepotent. (Of course the question of too close inbreeding is not forgotten, and must not be overlooked by the breeder.) The writer is a thorough believer in the use of mature bulls of known value as sires.

The chief objection made to bulls of some age is that they are likely to be vicious and dangerous. Everyone recognises the difference in temperament between the fleshy, beefy bull and the one of pronounced dairy character; but experience and observation have taught that the bulls of marked dairy type are much alike in disposition, regardless of breed. In all the breeds (as among men) some bulls will be found of naturally bad temper, but it is believed that the great majority of bulls, of all the dairy breeds, can be safely kept until too old for service and handled without serious trouble, if only properly reared and judiciously managed.

In rearing a bull, accustom it to be handled from calfhood, but without fondling or encouraging frolic. Give it kind, quiet, firm, and unvarying treatment, and keep it always under subjection, that it may never know its strength and power. Insert the nose ring before it is a year old, keep this renewed so as to be always strong, and always lead and handle the animal with staff in the hands of a discreet and trusty man. The bull should never run loose in yard or pasture, but should be provided with abundant and regular exercise, always under restraint and full control. The "walk around" arrangement, like the sweep horse power, affords a fair degree of voluntary exercise, but is hardly sufficient. The best plan seems to be to provide a suitable tread power with a governor attached, place the bull in this daily, and let him walk a fixed time or known distance. The main object should be regular and sufficient exercise for the bull. Incidentally, he may be made to run a fodder cutter or a cream separator and perform valuable service. As age and strength increase, let the staff be supplemented by strap, chain, or rope attached to a second ring. To this may well be added some hitching or leading chain with a strong strap around horns or neck. Let there be always a double hitching device, so that the bull may never by accident find himself loose when he should be tied. If restiveness and temper are shown, add to the exercise, in duration or quantity, without violence; a bull physically tired may be depended upon to be quiet and easily managed.

It is much better to keep the bull as much as possible in the presence or in full sight of the herd than stabled by himself in a lonely place. Let him be in the same room with the cows during the stabling season, and at milking times the rest of the year.

INDIVIDUALITY AND CULLING THE HERD BY ITS RECORD.

As soon as the herd is established and in working order, the study of every individual animal should begin. To guide rational treatment and insure greatest profit, the owner must become familiar with the characteristics of every cow. Peculiarities of temperament, susceptibility to surroundings and varied conditions, and especially the dairy capacity of the animal, should be matters of observation, deliberation, and record, not merely of conjecture and memory. The record of the herd is a matter of the utmost importance. The system of record should conform to the circumstances of the case and extent of the business. (It is desirable to reduce the labour of book-keeping to a minimum, and yet accuracy and sufficiency of record must be secured. Fortunately, inexpensive forms can now be found for sale, which are based upon long experience, and in variety to suit different wants.) The record should include a concise history and description of every member of the herd, with a summary of the dairy performance. The latter requires a daily record of the milk yield of every cow, with notes explaining irregularities or occurrences of interest. If the quality of the milk is a matter of any importance, as it is in most cases, and ought to be, however the milk is disposed of, a fat test should be made of the milk of every cow, for several consecutive milkings, as often as practicable. Some form of the Babcock tester is the simplest, and now within reach of every dairyman. According to the size of the apparatus, a certain number of milk samples can be tested at one time, and thus the record of a large herd can be completed in a few days. It is well to make this test and record of the quality of every cow's milk at least once a month. The most satisfactory practical record is the average percentage of fat found in the milk of several successive milkings, samples from which may be mixed and this "composite sample" tested, thus obtaining the average. The method is easily learned and practised. This record of quality, taken periodically, joined with a summary of the daily quantity of milk, gives a full dairy record of the cow, upon which her value can be readily computed. To give the owner a more complete knowledge of his operations, there should also be a record, of at least approximate accuracy, of the food of every cow, with monthly summaries of quantities or value, so that the economy of production may be shown.

Such records are far more easily made than the description may indicate, and are well worth all they cost. They form the only accurate and safe basis for judging of the individual merits of the different animals. The improvement of every herd, which should be the constant aim of its owner, depends upon periodical culling and getting rid of unworthy members. No one can afford to do this upon guesswork alone. One well authenticated example of the value of keeping such record follows: A dairyman of wide reputation, president of a State association for years, concluded to adopt the daily milk record, rather because of those who advocated it than of any conviction of needing it himself. His herd was of his own breeding; he had handled every cow from its birth, and he and his sons did the milking. Before beginning the record he made note of the joint opinion of himself and sons as to the half dozen best cows in the herd and an estimate of their season's milk yield. When the year's record was completed it was found that in order of actual merit the cows actually stood thus: First, his fifth; second, a cow not on his merit list; third, his fourth; fourth, his first; fifth, his sixth; sixth, like the second; and his second and third still lower on the list. These facts were verified by subsequent records. Still more remarkable, this experienced owner proved literally "by the book" that about one-fourth of his cows were being kept at an actual loss, while others barely paid their way.

Good judges believe that in the entire country one-third of the cows kept for their milk do not pay for their cost of keeping, and nearly a third more fail to yield annual profit. As a matter of ordinary business prudence and a condition essential to best results, every dairyman should study the individuality of his cows, keep a sufficient record of quantity and quality of milk product, know approximately the cost of production, and systematically weed out his herd. After proper consideration and practical tests as to possibilities, set a standard for a satisfactory cow, and maintain this standard by promptly disposing of the animals which fail to attain it, unless reasonable excuse appears, with the prospect of better conduct in future, and gradually but persistently raise the standard.

(To be continued.)

WHITEWASH THE POULTRY-HOUSE.

There is more virtue in whitewash for the poultry-house than most people are willing to credit. There are two ways to apply whitewash to the inside of a poultry-house. One is with a brush and the other with a spray pump. These pumps are obtainable almost anywhere now, and are the best implements for putting on whitewash. The sides and ceiling of the poultry-house should be given an application of whitewash. The roosts and the nest boxes should not be neglected. The whitewash should be of the consistency of thick cream, and it will be found a good plan to put some kerosene in each pailful. Mites can be killed, and lice will not survive where a frequent and thorough application of whitewash is given. One can put on some old slip of a garment and an old hat, and with a spray pump can, in a few minutes, have a good application of whitewash that will make everything sweet and clean. What falls on the floor will make a good floor itself when mixed with the hard dirt or coal ashes, or of whatever material the floor is made. Make free use of whitewash from now on during the active season of lice and mites, and see how few of them will be found at the close of the season. The fight against vermin must be persistent and continuous. One application will be good as far as it goes, but it is inadequate.

ANSWERS TO CORRESPONDENTS.

Mr. Layton, Donnyboook, writes: "I should feel obliged if you will please answer the following questions on Bee matters:—

(1.) How can pollen be got out of combs that are about half full of it?

(2.) Is it desirable to get the pollen out of the comb, or will the bees shift it?

(3.) How can it be ascertained when bees are likely to swarm?

(4.) How often is it necessary to examine the hives?

(5.) As at this time of the year the hives are empty of stores, and as I have some honey and pollen mixed from last year's combs, can I feed this to the bees?"

On referring the above to the Bee Expert, Mr. Sutton replies as follows:—

"(1.) Steep the combs in warm water until the pollen is quite soft then place the frame in the extractor and expel the pollen.

(2.) At those times only when the frames may be considered of particular value; but it is very questionable whether it is worth while to waste time to this end.

(3.) The only sure sign is a crowded hive and queen cells started.

(4.) This is a matter which only those having charge of an apiary can judge of, excepting during swarming time; then the hives should be closely examined for queen cells every ninth day.

(5.) I would not advise feeding old honey and pollen. It would be better and safer to give them a mixture of best white sugar and water, equal parts of each, and feed with a Boardman feeder."

DALGETY'S REPORT.

Messrs. Dalgety & Co., Limited, Wool and Grain Brokers, report as follows in connection with their Perth and Fremantle markets for the month ending 6th November, 1903:—

Business in farm produce during the last month has somewhat contracted, as with the early approach of the new season and the uncertainty as to the results of the harvest, buyers have confined their operations to immediate requirements.

Chaff.—Throughout October, contrary to expectations, supplies have come forward very slowly, in fact barely sufficient chaff being offered to fulfil the demand. There has been a considerable falling off in the supplies of last season's chaff, the bulk of the arrivals consisting of new stuff, which generally came forward in a satisfactory condition. The market has fluctuated from 5s. to 10s. per ton, just according to the quantities offering, but closing rates are on a parity with prices prevailing four weeks ago. From private advices we anticipate that chaff will now come forward more freely to the local markets, and we must therefore look for a decline in values. Closing prices are as follows:—

Last season's prime green ...	£4 15s. to £5 7s. 6d. per ton
New season's prime wheaten ...	£4 15s. to £5 5s. per ton

Of course many trucks of new season's chaff arrive in a more or less heated condition, and for these we had to accept a reduction on current rates, it being advisable that the chaff be handled quickly rather than risk deterioration. Other values are as follows:—

Prime oaten (very scarce) ...	£4 15s. to £5 5s. per ton
Medium oaten	£4 to £4 12s. 6d. per ton

Other qualities of oaten and wheaten from 50s. per ton upwards.

Up to the present time inferior samples of chaff have met with a weak demand, owing to there being plenty of green stock feed available. We anticipate, however, that as the summer progresses the consumption of lower grade chaff will increase. During the month we sold about 1,000 tons of chaff at market rates, and our sales have been materially assisted by orders from districts which in normal seasons produce their own fodder.

Pressed Straw.—Very little forward; demand steady. During the month we sold about 40 tons at prices ranging from £4 10s. to £5 per ton. As the season progresses this price, of course, must weaken considerably.

Algerian Oats.—Limited business transacted. Values have declined as follows:—

Clean heavy milling, extra prime, from 3s. 4½d. to present rate of from 2s. 9d. to 2s. 11d. per bushel

Other qualities declined from 2s. 11d. to 2s. 6d. per bushel.

We anticipate that Algerian Oats will play a more important part than hitherto over ordinary food, as values in proportion to Zealands are likely to be very low, this fact being assisted by the gradual reduction of our Interstate duty, which continues to place Zealands at a greater disadvantage. At the present time there is a decided prejudice against Algerians for ordinary food purposes, but we anticipate being able to overcome this difficulty so long as we are assisted by the difference in price. There is an extensive business in oats transacted in Western Australia, and this has hitherto been confined almost entirely to New Zealand produce.

Barley.—No local offering. Demand limited. Prime "Chevalier," 4s. 6d. per bushel, nominal value. This line has weakened from 5s. to the above price, with prospects of a further fall.

Hay.—At the beginning of the month there was a deal of enquiry, both on the part of buyers and sellers, in connection with new season's, but until the last few days there was little business transacted. Sellers have considerably modified their former ideas of prices, and we have effected sales of about 500 tons at from £2 15s. to £2 17s. 6d. per ton f.o.r. at adjacent country stations, and also 100 tons of self-sown hay at a much lower figure.

Wheat.—Supplies on spot are about sufficient for present requirements, but during the month the whole of the wheat recently imported from America passed into second hands, and this fact is of course responsible for an improved tone on our local markets, although no alteration in prices could be reported. Last season's local milling is worth from 5s. 4d. to 5s. 5½d. per bushel f.o.r. at Perth and Fremantle, but even at these prices a very large quantity could not be placed, as the advent of much wheat in the country would considerably weaken the tone of the market.

AT KALGOORLIE.

Almost similar conditions have prevailed at this market, which, of course, so far as local produce is concerned, is confined to chaff and oats. Towards the middle of the month supplies came forward so freely that buyers immediately expected that the markets would be glutted, and the consequence was that there was a temporary decline of 10s. per ton. However, with a falling off in the arrivals, values somewhat recovered, although generally this market, in sharp contrast to Perth and Fremantle, has been gradually weakening, and prices are now fully 15s. per ton lower than prevailing rates at the beginning of October. Closing rates are as follows:—

Prime green wheaten (last season's) ... £6 10s. to £6 15s. per ton
" " (new season's) ... £6 5s. to £6 10s. per ton

Inferior samples up to the present have been in weak demand, owing to the prevalence of green food on the goldfields, but with the advent of hot weather we may look for an increased demand for inferior qualities. During the month we sold 325 tons of chaff at market rates.

Oaten Hay.—With the racing season practically over, this line is in weak demand, except for specially prime qualities. There is a considerable quantity of oaten chaff imported from Victoria, for which buyers show a distinct preference over the local product. However, if farmers would endeavour to grow oaten hay that was entirely free from other grain, such as wheat, etc., we feel sure that the demand for local hay would increase.

GARDEN NOTES FOR DECEMBER.

By Percy G. Wicken.

The exceptional late rains experienced this season, extending right up to the end of October, will be of great benefit to all those engaged in gardening operations, and will enable a supply of vegetables to be grown considerably later in the season than usual. Vegetables of nearly all descriptions are very plentiful in the city this season, owing to the favourable season experienced in parts of the country. The better class of produce sells readily at satisfactory prices, while the inferior quality is sometimes hard to dispose of at any price. While travelling through farming districts it is astonishing to notice how few farmers have any gardens at all or pay any attention to raising vegetables. Apart from the question of growing vegetables for market purposes, every farmer or settler should make a point of growing a supply of vegetables and planting a few fruit-trees round about his house for his own use. Very little time need be spent over it, as all the spare half hours can be utilized looking after the garden without interfering with the farm work. In a season like the present, when all kinds of vegetation has made such a luxurious growth, everyone in the country should be able to grow sufficient vegetables for their table, and have plenty to spare. A liberal diet of vegetables will keep themselves and families in better health than continually living on meat, and also tend to decrease the store bill for other foods.

The principal work in the garden during the month will be to keep the ground well stirred, to consume the moisture, and to cut down all weeds.

Beans (French or Kidney).—Are now plentiful in the market and at the prices obtained should yield a handsome profit to the grower. There are a number to choose from, the butter bean being one of the best. The pods should be picked as soon as they attain any size, as the plants yield more if the pods are not allowed to mature.

Beans (Lima).—The early-sown Limas should now be making good growth, and the climbing varieties be ready for staking. A further supply may be planted.

Beet (Silver).—A further supply of seed may be sown and any young plants planted out from the beds. The green leaves will be very acceptable during the hot weather.

Cabbage.—A few plants may be put out in moist situations but will require shading when transplanted.

Celery.—A little seed may be sown to keep up a succession of young plants.

Chokos.—Fruits of this vine, which have good shoots, may be planted in moist places. The vines are prolific and the fruit a novelty.

Cucumbers.—The early-sown plants should now have plenty of cucumbers on them. A little more seed may be sown if required. A sharp lookout should be kept for cut worms, which eat through the stem of the plant and cut the plant down. These grubs are generally found round the roots, and should be poisoned with a little bran and Paris green mixed together and laid where the grubs will find it.

Egg Plant.—Young plants can be planted out and a little more seed sown.

Maize (Sweet).—May still be sown in moist situations. It makes an excellent vegetable, and should be extensively cultivated. They are mostly dwarf varieties, and can be sown closely together.

Melons.—Early rock melons should now be ripe, and the water and preserving melons should be well forward. Keep the ground stirred until the vines cover the land.

Pumpkins and Squashes.—In the cooler districts a little more seed may be sown but they will only succeed in favourable localities.

Sweet Potatoes.—If the young shoots are not already planted out, they should be put out at once, and will require shading from the sun for a day or two until established. They are better planted on hills, about three feet apart, and one foot apart in the rows.

Tomatoes.—Tomatoes are now coming in from the Northern districts. The early sown plants in most districts will be well forward. As many more plants as possible should be planted as this fruit is always acceptable. Manure the plants, well and tie up to stakes as soon as plants are large enough.

Farm.—Harvesting the hay crop and also the early barley and oats for grain will make all those engaged in farming operations busy during this month. Although harvesting was started early in October in the earlier districts, the unsettled weather towards the end of the month caused work to be suspended and thereby delayed the hay-making until early in November, but given the usual harvesting weather in November good progress should be made. Owing to the favourable season a bountiful harvest may be anticipated and the State, as a whole, should go nearer to supplying its own demands in wheat and chaff than we have ever done before. Heavy crops of hay, taxing the resources of the harvesting machinery, is the general rule, and also excellent prospects of a good grain crop hold out alluring prospects to the settler, and although the price will not be as high as during the past year, the heavy crop should help to make up in some measure for this loss. When the hay or straw stacks are being built a few furrows should be ploughed all round the stack-yard to protect them from fire, and fire-breaks should also be ploughed round all the paddocks in which the crop is to be left for grain.

In moist localities sorghum, soy beans, cow peas, and French millet may be sown with good prospects of a successful crop.

THE CLIMATE OF WESTERN AUSTRALIA DURING OCTOBER, 1903.

The climate map shows that the summer is making itself felt in the Tropics, 100 degrees or over being recorded at all stations there, but the rainy season has not yet set in.

South of the tropics both the day and night temperatures were considerably below the average for previous years, and the atmospheric pressure throughout the State below normal.

A good rainfall was again experienced in the agricultural districts, being especially heavy between Katanning and Bridgetown towards the end of the month. Very little fell north of Geraldton, and slightly above the average inland over the Goldfields.

Two storms of rather a rare type are worth noting. The first made its appearance off the west coast on the 16th. Working its way down the coast as far as Bunbury, it passed inland on the following day. Light to heavy rain was recorded from Shark's Bay southwards, and very rough weather experienced along the Bight on the 18th. The second storm, at the end of the month, was of a similar type. It was preceded by warm and sultry weather and accompanied by thunderstorms and general rains throughout the State south of the latitude of Geraldton, being especially heavy in the extreme south-west.

A fall of snow was recorded at a few places in the South-West on the 10th of the month.

The Climate of Western Australia during October, 1903.

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						October, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:	Wyndham ...	29·870	29·909	29·988	29·738	98·5	80·2	89·4	105·0	76·7	98·3	78·9	110·2	71·2	3	4557
	Derby	29·890	29·923	30·015	29·757	96·9	71·5	84·2	105·0	64·0	96·8	71·0	112·2	58·6	*Nil*	2188
	Broome ...	29·898	29·924	30·005	29·695	89·0	71·0	80·0	101·0	62·0	91·2	69·9	108·6	52·8	*Nil*	1618
	Condon ...	29·912	29·952	30·044	29·786	88·3	61·1	74·7	101·2	51·0	92·2	61·5	108·2	49·0	*Nil*	925
	Cossack ...	29·910	29·969	30·144	29·914	90·3	63·4	76·8	101·0	56·8	93·3	65·8	110·5	56·0	*Nil*	967
	Onslow ...	29·950	29·974	30·100	29·840	85·0	59·0	72·0	100·0	51·0	89·5	60·1	108·5	48·5	*Nil*	635
	Carnarvon ...	29·984	30·040	30·147	29·740	77·2	60·9	69·0	93·2	52·3	78·1	60·7	100·6	46·2	19	1234
	Hamelin Pool...	29·970	30·030	30·140	29·770	83·0	55·0	69·0	102·0	45·0	81·7	55·0	100·6	44·6	30	739
	Geraldton ...	29·950	30·072	30·160	29·790	73·0	55·0	64·0	98·0	48·0	72·8	55·3	100·0	43·0	111	2374
INLAND:	Hall's Creek *	29·912	29·938	30·038	29·710	97·8	68·7	83·2	104·0	57·4	98·4	67·7	108·0	48·4	33	3162
	Marble Bar ...	...	...	...	...	98·6	70·6	84·6	105·0	60·0	...	...	...	...	*Nil*	656
	Nullagine * ...	29·895	29·986	30·124	29·712	93·7	60·7	77·2	100·0	46·0	95·6	60·8	107·0	43·9	*Nil*	666
	Peak Hill ...	29·925	29·964	30·070	29·630	82·0	58·0	70·0	92·0	46·0	86·0	59·4	97·6	41·3	*Nil*	524
	Wiluna ...	29·916	...	30·160	29·553	81·7	54·0	67·8	91·5	42·0	...	...	...	...	6	716
	Cue	29·968	30·002	30·181	29·726	81·2	54·6	67·9	93·8	41·2	83·3	55·0	99·0	41·5	13	565
	Yalgoo ...	29·944	30·014	30·174	29·683	78·6	51·4	65·0	96·4	39·2	81·3	52·9	98·6	41·0	25	708
	Lawlers ...	29·934	29·981	30·190	29·516	79·1	52·7	65·9	94·1	42·1	83·1	56·3	99·9	41·2	23	905
	Laverton ...	29·968	...	30·297	29·727	78·9	52·6	65·8	95·9	42·4	...	...	...	...	18	834
	Menzies ...	29·992	29·986	30·276	29·662	76·9	50·9	63·9	92·2	39·5	80·3	54·0	99·0	41·1	60	1331
	Kanowna ...	...	...	...	...	79·5	52·7	66·1	90·0	38·0	...	...	...	...	88	1058
	Kalgoorlie ...	29·969	29·991	30·302	29·469	75·9	50·3	63·1	89·2	40·6	78·7	53·3	97·6	40·5	85	958
	Coolgardie ...	29·945	29·997	30·310	29·507	74·6	48·7	61·6	88·7	39·2	78·7	51·6	99·8	40·0	46	815
	Southern Cross	29·951	29·986	30·249	29·547	75·0	48·0	61·5	93·0	35·0	78·2	49·2	97·8	35·8	81	789
	Walebing ...	...	...	...	...	69·3	47·2	58·2	92·2	35·0	...	...	...	...	277	2150
	Northam ...	...	...	...	...	71·0	48·0	59·5	92·8	38·5	...	...	...	...	180	1742
	York	29·980	30·032	30·260	29·560	70·0	46·0	58·0	92·0	37·0	73·7	46·8	91·5	31·4	147	1597
	Guildford ...	...	...	...	...	71·0	51·4	61·2	93·0	42·5	...	...	...	...	336	3524

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during October, 1903—*continued.*

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						October, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1
SOUTH-WEST AND SOUTH COAST:	Perth Gardens ...	29·992	30·063	30·238	29·555	70·2	53·7	62·0	90·4	42·4	72 7	52·4	97·0	38·0	249	3386
	Perth Observatory	29·996	30·052	30·246	29·567	68·2	53·1	60·6	89·9	41·1	69·2	53·4	88·5	42·2	224	3376
	Fremantle ...	30·028	30·037	30·300	29·618	66·7	54·7	60·7	86·8	41·8	67·5	56·2	86·6	46·0	217	3176
	Rottnest ...	29·980	30·022	30·259	29·563	66·7	54·6	60·6	83·2	43·0	67·7	56·7	85·2	45·6	116	2750
	Mandurah ...	...	...	...	...	68·9	60·0	64·4	89·1	45·0	...	...	...	...	284	3603
	Wandering ...	...	...	...	...	65·3	39·9	52·6	74·0	30·0	...	...	...	...	206	2711
	Collie	...	...	...	...	66·8	44·9	55·8	88·9	33·7	..	...	...	...	399	3658
	Donnybrook ...	...	...	...	...	66·8	51·4	59·1	88·7	40·1	...	...	...	...	369	3646
	Bunbury ...	29·980	30·043	30·290	29·540	67·0	50·0	58·5	86·0	37·0	68·4	51·0	89·2	38·8	300	4286
	Busselton ...	...	...	...	...	67·8	47·2	57·5	86·0	37·0	...	...	...	...	261	3019
	Cape Naturaliste	...	...	...	...	63·8	50·7	57·2	78·0	42·0	...	...	...	...	252	...
	Bridgetown ...	...	...	...	...	66·2	43·5	54·3	86·0	31·0	...	...	...	...	546	3576
	Karridale ...	29·957	30·034	30·252	29·572	63·0	48·0	55·5	79·0	37·0	66·1	50·6	85·2	37·0	416	3882
	Cape Leeuwin ...	29·935	29·991	30 290	29·400	62·0	54·0	58·0	72·0	45·0	64·6	55·1	82·8	45·4	301	2714
	Katanning ...	29·960	30·007	30·310	29·530	66·0	45·0	55·5	85·0	35·0	69·1	46·0	87·0	31·0	345	2289
	Albany	29·954	29·994	30·367	29·520	63·1	46·3	54·7	75·0	35·5	65·6	49·8	83·0	38·5	494	3751
	Breaksea... ...	29·945	29·994	30·470	29·390	60·0	51·0	55·5	68·0	39·0	62·2	52·2	78·0	39·2	397	2826
	Esperance ...	29·950	30·006	30 450	29 600	69·0	54·0	61·5	87·0	49·0	69·6	51·7	101·4	36·2	229	2330
	Balladonia ...	29·969	...	30·395	29·586	74·7	45·8	60·2	91·0	35·2	...	...	...	...	94	812
	Eyre*	29·958	30·032	30·446	29·694	72·9	48·2	60·6	99·6	34·2	72·2	51·7	97·5	30·0	78	1082
						INTER-STATE.										
	Perth	29·996	30·052	30·246	29·567	68·2	53·1	60·6	89·9	41·0	69·2	53·4	88·5	42·2	224	3370
	Adelaide	30·020	30·021	30·350	29·590	74·7	53·0	64·0	94·8	41·0	72·7	51·4	100·5	36·0	66	...
	Melbourne	30·043	29·883	30·395	29·602	70·2	50·8	60·5	87·7	40·8	67·0	48·1	96·1	32·1	277	...
	Sydney	30·150	29·998	30·410	29·760	67·0	55·0	61·0	78·0	49·0	71·1	55·9	99·7	43·3	411	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
October, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for September, 1903 (completed as far as possible), and for October, 1903 (principally from Telegraphic Reports).

Stations.	September.		October.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
East Kimberley:				
Wyndham	Nil	...	3	2
6-Mile	...	...	...	...
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	...	...
Rosewood Downs	...	...	...	...
Argyle Downs	...	...	...	...
Lisadell	...	...	...	...
Turkey Creek	Nil	...	43	1
Plympton, St. Mary	...	...	...	...
Koojubrin	...	...	...	...
Hall's Creek	Nil	...	33	2
Flora Valley	...	...	...	...
Ruby Plains	...	...	...	...
Denison Downs	Nil	...	35	...
West Kimberley:				
Obagama	...	...	...	...
Beagle Bay	...	...	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa	...	...	...	...
Mt. Anderson	...	...	...	...
Leopold Downs	...	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun	...	...	...	...
Nookanbah	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	Nil	...	...	...
Thangoo	...	...	...	...
La Grange Bay	Nil	...	Nil	...
North-West:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	Nil	...
DeGrey River	Nil	...	...	...
Port Hedland	1	1	Nil	...
Boodarie	...	...	...	...
Warralong	Nil	...	...	...
Muccan	Nil	...	...	...
Ettrick	...	...	...	...
Mulgie	Nil	...	...	...
Eel Creek	...	...	...	...
Pilbarra	Nil	...	Nil	...
North-West—*cont.*				
Coongon	...	...	...	...
Warrawagine	Nil	...	...	...
Bamboo Creek	Nil	...	Nil	...
Marble Bar	1	1	Nil	...
Warrawoona	Nil	...	Nil	...
Corunna Downs	5	1	...	...
Nullagine	Nil	...	Nil	...
Yandicoogina	...	...	...	...
Kerdiadary	5	1	...	...
Roy Hill	...	...	...	...
Mosquito Creek	...	...	...	...
Mulga Downs	4	1	...	...
Woodstock	...	...	...	...
Mt. Florence	...	...	...	...
Tambrey	7	1	...	...
Millstream	...	...	...	...
Yandyarra	...	...	...	...
Mallina	...	...	...	...
Whim Creek	Nil	...	Nil	...
Cooyapooya	...	...	...	...
Woodbrooke	...	...	...	...
Croydon	Nil	...	...	...
Balla Balla	Nil	...	Nil	...
Roebourne	Nil	...	Nil	...
Cossack	1	1	Nil	...
Fortescue	Nil	...	Nil	...
Mardie	Nil	...	...	...
Mt. Stewart	49	1	...	...
Yarraloola	...	...	...	...
Chinginarra	Nil	...	...	..
Onslow	3	1	Nil	...
Peedamullah	12	1	...	...
Red Hill	...	...	...	...
Mt. Mortimer	21	1	...	...
Wogoola	...	...	...	...
Nanutarra	...	...	...	...
Yanrey	10	1	...	...
Point Cloates	...	...	...	...
Gascoyne:				
Winning Pool	31	2	Nil	...
Towara	21	2	...	...
Ullawarra	...	...	...	...
Maroonah	33	2	...	...
Gifford Creek	...	...	...	...
Bangemall	...	...	...	...
Bernier Island	...	...	...	...

RAINFALL—*continued.*

STATIONS.	SEPTEMBER.		OCTOBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Minnie Creek ..	41	2	...	...
Yanyeareddy ...	25	1	...	...
Boolathana ...	58	4	...	...
Carnarvon ...	63	3	19	4
Brick House ...	46	3	...	...
Upper Clifton Downs	42	2	...	..
Errivilla	...	...	...	...
Dirk Hartog Island	144	10	...	...
Sharks Bay ...	190	5	46	3
Kararang ...	...	...	...	...
Meedo	Nil	...	7	1
Tamala	151	12	...	...
Wooramel ...	105	7	27	3
Hamelin Pool ...	91	5	30	4
Yarra Yarra ...	...	...	...	...
Berringarra ...	46	2	...	...
Mt. Gould ...	92	2	9	1
Moorarie ...	90	2	70	2
Wandary... ...	...	...	...	...
Peak Hill ...	25	2	Nil	...
Horseshoe ...	21	2	Nil	...
Mount Frazer ...	8	1	31	1
Abbotts	76	3	51	1
Belele	79	2	...	...
Mileura	66	2	...	...
Milly Milly ...	35	2	7	1
Manfred ...	59	3	20	1
New Forest ...	54	4	..	...
Woogorong ...	82	4	...	...
Boolardy... ...	61	2	Nil	...
Twin Peaks ...	57	5	10	1
Billabalong ...	...	...	...	...
Wooleane ...	66	5	18	1
Murgoo	64	3	72	3
Meeka	...	...	...	...
Mt. Wittenoom ...	106	3	...	...
Nannine	114	3	8	1
Star of the East...	114	3	7	1
Annean	62	3	27	2
Tuckanarra ...	46	3	12	2
Coodardy ...	45	3	...	...
Cue	42	6	13	2
Day Dawn ...	41	4	13	2
Lake Austin ...	41	5	28	2
Lennonville ...	101	7	14	4
Mt. Magnet ...	103	4	5	1
Challa	43	2	8	1

STATIONS.	SEPTEMBER.		OCTOBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Murrum	62	2	41	2
Burnerbinmah ...	62	8	...	...
Mellenbye ...	131	9	101	7
Barnong	130	7	...	...
Yalgoo	33	4	25	4
Wagga Wagga ...	87	7	12	2
Gabyon	89	4	14	1
Gullewa	126	8	75	3
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	251	14	...	...
Mount View ...	...	...	...	...
Mumby	384	16	146	9
Yuin	65	9	...	...
Northampton ...	454	16	178	7
Mt. Erin ...	410	12	177	7
Oakabella ...	328	13	...	...
Tibradden ...	...	...	...	...
Sand Springs ...	382	12	...	...
Mullewa... ...	321	13	79	7
Kockatea ...	312	11	108	7
Bootenal ...	...	...	...	...
Geraldton ...	354	18	111	10
Greenough ...	486	15	181	10
Dongara ...	352	16	192	9
Dongara (Pearse)	339	14	192	10
Mingenew ...	301	19	145	10
Urella	275	16	...	...
Yandenooka ...	359	15	130	8
Rothesay ...	147	9	...	...
Field's Find ...	60	8	44	4
Carnamah ...	252	15	126	11
Watheroo ...	298	17	182	12
Dandaragan ...	576	17	409	14
Moora	392	15	311	13
Yatheroo ...	624	12	326	13
Walebing ...	422	17	277	13
New Norcia ...	552	16	256	16
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	873	16	310	12
Belvoir	768	18	257	13
Mundaring ...	1100	20	329	17
Guildford ...	923	22	336	17

RAINFALL—*continued.*

Stations.	September.		October.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN—*continued.*				
Canning W't'r'w'ks	613	17	142	11
Perth Gardens	798	21	249	18
Perth Observatory	772	20	224	18
Subiaco	683	20	183	17
Claremont	674	17	169	14
Fremantle	655	21	217	16
Rottnest	456	21	116	13
Armadale	764	20	286	12
Rockingham	679	19	314	11
Canning River	1112	19	295	11
Jarrahdale	1239	20	413	15
Mandurah	759	21	284	13
Pinjarra	916	21	401	16
Yarloop	897	23	377	17
Harvey	978	21	213	15
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley	276	13	...	...
Momberkine	...	...	161	7
Monglin	315	16	244	10
Newcastle	557	14	197	7
Eumalga	634	17	153	10
Northam	506	13	180	10
Grass Valley	379	14	198	9
Meckering	273	16	125	10
Cunderdin	303	14	138	9
Codg-Codgin	221	18	94	11
Yarragin	270	12	...	...
Doongin	239	12	109	7
Cuttenning	262	17	...	...
Whitehaven	361	20	175	12
Sunset Hills	465	16	165	9
Cobham	576	17	173	15
York	537	19	149	13
Beverley	477	15	183	11
Barrington	426	17	120	10
Stock Hill	424	15	116	9
Sunning Hill	449	16	...	...
Wandering	673	18	206	11
Glen Ern	534	20	145	14
Pingelly	446	16	158	8
Woogenellup	392	20	420	15
Marradong	682	18	273	11
Bannister	611	20	...	...
Narrogin	439	18	177	13

Stations.	September.		October.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*				
Wickepin	375	17	...	...
Gillimaning	343	18	...	...
Bunking	446	14	246	11
Bullock Hills	324	18	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury	629	20	300	14
Collie	772	23	399	19
Glen Mervyn	808	19	420	16
Dardanup	807	19	...	...
Donnybrook	737	19	369	17
Boyanup	757	20	359	18
Ferndale	780	17	547	13
Busselton	558	22	261	15
Quindalup	623	21	310	16
Cape Naturaliste	346	20	252	17
Lower Blackwood	1110	25	791	17
Karridale	473	23	416	20
Cape Leeuwin	322	26	301	21
Biddellia	676	22	704	18
The Warren	899	18	658	16
Lake Muir	558	20	541	19
The Peninsula	782	25	535	22
Mordalup	510	20	481	17
Deeside	663	20	549	19
Riverside	646	18	576	17
Balbarup	646	22	612	18
Wilgarup	699	22	637	17
Mandalup	...	...	383	14
Bridgetown	758	23	614	21
Westbourne	558	21	427	18
Hilton	441	13	371	9
Greenbushes	915	16	723	13
Greenfields	744	19	495	17
Glenorchy	468	13	...	..
Williams	441	20	228	15
Arthur	387	14	278	11
Darkan	378	12	274	8
Wagin	371	15	298	10
Glencoe	388	17	383	12
Dyliabing	337	18	174	12
Katanning	484	22	352	15
Kojonup	554	20	462	15
Broomehill	831	20	697	14
Sunnyside	380	21	298	14
Woodyarrup	384	19	427	13
Cranbrook	480	20	425	13

RAINFALL—*continued.*

Stations.	September.		October.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*contd.*				
Blackwattle ...	329	11	...	...
Mt. Barker ...	474	22	...	...
Kendenup ...	523	20	495	17
St. Werburgh's...	484	19	422	21
Forest Hill ...	490	21	546	21
Denmark ...	663	24	640	12
Grasmere ...	525	23	540	19
Albany	512	23	494	19
King River ...	414	18	414	13
Point King ...	418	16	330	14
Breaksea ...	429	20	397	17
Wattle Hill ...	603	16	588	16
Cape Riche ...	243	13	294	10
Pallinup ...	369	15	277	13
Bremer Bay ...	370	20	338	12
Jarramongup ...	...	...	...	...
Eastern Division:				
Dural	27	2	...	...
Lake Way ...	16	2	6	3
Gum Creek ...	30	1	60	1
Mt. Sir Samuel ...	12	1	51	2
Lawlers	Nil	...	23	4
Leinster G.M. ...	21	1	34	2
Mt. Leonora ...	5	2	47	5
Mt. Malcolm ...	Nil	...	63	5
Mt. Morgans ...	9	3	27	3
Laverton ...	6	1	18	1
Murrin Murrin...	11	3	34	3
The Granites ...	19	4	37	4
Tampa	Nil	...	25	1
Kookynie ...	20	4	62	3
Niagara	2	1	73	3
Yerilla	16	5	93	2
Edjudina ...	15	2	92	5
Menzies	41	3	60	4
Mulline	31	3	26	2
Waverley ...	43	6	98	6
Goongarrie ...	45	5	69	3
Mulwarrie ...	68	10	64	5
Bardoc	47	2	52	2
Kurawa	95	5	97	6
Kurnalpi ...	35	4	59	4
Bulong	55	6	86	4
Kanowna ...	73	7	88	6
Kalgoorlie ...	59	8	85	4

Stations.	September.		October.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Eastern—*contd.*				
Coolgardie ...	60	11	46	6
Burbanks P.O. ...	43	6	44	5
Woolubar ...	70	10	98	4
Widgiemooltha...	84	9	67	5
50-Mile Tank ...	86	8	92	6
Waterdale ...	59	9	48	3
Norseman ...	43	5	66	6
Lake View ...	69	9	107	9
Bulla Bulling ...	59	10	56	4
Woolgangie ...	102	6	87	3
Boondi	107	10	82	7
Boorabbin ...	133	12	72	5
Koorarawalyee ...	128	9	97	5
Karalee	147	8	85	5
Yellowdine ...	171	9	76	3
Southern Cross...	112	12	81	6
Parker's Road ...	129	8	94	6
Mt. Jackson ...	110	4	...	...
Bodallin ...	150	6	96	7
Burracoppin ...	155	6	...	...
Kellerberrin ...	283	13	...	...
Merredin ...	185	8	90	7
Mangowine ...	201	15	95	7
Eucla Division:				
Ravensthorpe ...	190	16	235	13
Coconarup ...	280	17	142	15
Hopetoun ...	231	17	239	13
Fanny's Cove ...	456	13	...	...
Park Farm ...	387	20	...	...
Esperance ...	422	17	229	16
Gibson's Soak ...	278	17	111	10
30-Mile Condenser	247	14	84	8
Swan Lagoon ...	158	16	...	...
Grass Patch ...	171	17	115	16
Myrup	487	18	182	14
Lynburn ...	418	14	...	...
Boyatup	525	17	...	...
Point Malcolm ...	349	17	...	...
Israelite Bay ...	232	11	97	10
Bulbina	294	13	...	...
Frazer Range ...	78	8	...	...
Balladonia ...	133	9	94	7
Southern Hills ...	76	6	84	3
Eyre	83	10	78	5
Eucla	50	7	78	5

The Observatory, Perth,
11th November, 1903.

W. E. COOKE,
Government Astronomer.

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NOTES.

STUD BULLS.—Elsewhere in this issue will be found a copy of the agreement that must be signed by anyone taking charge of one of the Government stud bulls.

FRUIT FLY.—We publish in this issue an interesting report from Mr. G. Compere, the Government Entomologist, who has just returned from India, where he has been in search of parasites to the fruit fly.

BREEDER'S TABLE.—This month is published a complete breeder's table for the year. By using this table farmers and others will know at a glance when to expect young stock, and so be properly prepared and have everything in readiness.

INCUBATORS.—In order to arrive at some definite idea as to the value of the various incubators on the market, those of our readers who have or have had an incubator are invited to send in their experience with it, giving the name of the machine, and whether it is hot water or air.

SCOUR IN CALVES.—Contagious scour in calves is a disease in which treatment is very often unsatisfactory. The following, however, may be attended by good effects :—As soon as a calf is observed ailing, give 1 scruple of salicylic acid (dissolved in half an ounce of rectified spirit of wine) in a wineglassful of linseed oil. This should be followed by a dessertspoonful of solution of chlorinated soda and one teaspoonful of laudanum, mixed together and given in a teacupful of starch or flour gruel (cold) from every three to twelve hours. One or two teaspoonsful of brandy may be occasionally added to this if the patient becomes very prostrate. When scour ceases, give cod-liver oil twice daily.—*Live Stock Journal.*

MR. DESPEISSIS' RETURN.—We are pleased to be able to announce that Mr. Despeissis, the Horticultural and Viticultural Expert to the Department of Agriculture of this State, will resume his duties about the end of this month. In this issue we publish two more of his interesting letters; brief as they are, they at least show that Mr. Despeissis has lost no opportunity in gaining an insight into the vine growing and wine making in Europe, and as the information gained will be available for the coming vintage, our wine-growers will be fortunate in having all up-to-date ideas placed at their disposal.

BEDDING FOR PIGS.—The great objection to the use of peat-moss litter as a bedding for pigs is that the pigs will eat it—a habit frequently fatal to young pigs. Not only is it indigestible, but it expands so much in the stomachs of the little pigs that death frequently ensues. Applying gas-tar to the woodwork of the piggeries will generally prevent pigs eating away the wooden benches; but this habit, and the eating of the straw bedding, frequently arises from the food given to the pigs not containing all that nature requires. A few cinders or pieces of small coal, or even a shovelful of mould, thrown into the sty every two or three days, will commonly check the troublesome and unhealthy habit.—*Exchange.*

KEEPING QUALITY OF BUTTER.—A report issued by the Iowa Experiment Station embodies the result of experiments conducted at the college to determine the effect of the washing-water on the keeping quality of butter. Deterioration in the keeping quality of butter is clearly due to the work of bacteria; and cream that is pasteurised can only become contaminated by contact with the utensils, and by the butter being washed with contaminated water after the cream has been churned. By scalding the utensils before they are brought into contact with the cream, this source of infection is largely overcome, so that the most effective remaining source of contamination is the wash-water. Some of the conclusions arrived at by the experimenters concerning the use of wash-water are as follows:—(1.) Water contains germs that cause butter to deteriorate in quality. (2.) These germs can be removed in a practical and inexpensive way by two processes—pasteurisation and filtration. (3.) Unwashed butter made from good, well-ripened cream keeps as well, and in some instances better, than the same butter when washed in unpasteurised water. (4.) The cost of pasteurisation of milk and water after the pasteuriser has been purchased is about ·1 of a half-penny per pound of butter. The amount gained per pound of butter by such pasteurisation when the butter is about a month old is ·8 of a cent.

EFFECTS OF THINNING TOMATOES.—At the Arkansas Agricultural Experimental Station experiments have been conducted to determine the effects of systematic thinning of tomato crops on the size of the fruit. In cultivating the plants under trial, all lateral branches below the first cluster of blossoms were pruned off with a sharp knife. The plants were tied to stakes, and the lot that were allowed to produce what fruit they would received no further attention than the necessary cultivation of the surrounding soil and occasional retying to the stakes as the plants grew. The plants were all sprayed occasionally with Bordeaux mixture, and while the leaves and stems were wet with spray were dusted with Paris green, mixed with four parts of flour or road dust. The thinned lot were given the same treatment, except that not more than three fruits were allowed to remain upon one cluster, and generally only two. The thinning was done as soon as the young tomatoes were half or three-fourths of an inch in diameter. The dead blossoms were removed as soon as possible, to prevent deforming. Frequently the young tomatoes, when not more than one-fourth of an inch in diameter, would show an irregular or improper shape, and this was of considerable advantage in enabling the selection of only the best fruit to remain on the vines. The thinning was done with a sharp knife. Deficient rainfall and excessively high temperature during the season affected the thinned plots less than those not thinned, since a majority of the fruit on the former had ripened very early. The tomatoes grown were mostly large kinds—Mikado, Ponderosa, Stone, Favourite, and Imperial. On the thinned vines the average number of fruit per vine was 9·7, the average weight of fruit per vine 9·57 pounds, and the average weight of each tomato 15·82 ounces. On the unthinned vines the average number of fruit per vine was 24·6, the average weight of fruit per vine 10·60 pounds, the average weight of each tomato being 6·86 ounces. While the weight of crop was decreased one-tenth by thinning, the bulk would have been about the same, as large tomatoes fill up faster. These results are interesting, as showing what can be done in the way of producing large tomatoes. For commercial requirements enormous fruits are not so much required nor so profitable as an even grade of medium size, the buyer being influenced more by the weight of the case than anything else.

AMONGST THE FRENCH VINEYARDS.

By A. Despeissis.

From Spain to France.

There are, besides the Pyrenees, a number of little trifles which all tend to impress on the railway traveller that the frontier has been crossed. First there is the break of gauge. Although this adds to inconvenience, it may add to safety and thwart a sudden invasion of the country. Then the Customs formalities are made as smooth on the French as they are vexatious on the Spanish side, where the search for any dutiable effects is carried on in the most ruthless manner. Long association with smuggling has led the Customs officials to regard every traveller as a probable smuggler. Here, too, we take leave of our faithful friends of the *guardia civil*, who, with their dark blue uniforms with red facings, their three-cornered hats, and their magazine rifles, add both safety and picturesqueness to travelling in Spain. So rife was highway robbery until not long ago in Spain, that even now there is not a train that leaves without one of these guardians of the public security. In this respect, indeed, the Sierra Morena especially achieved particular notoriety. Other indications as well exist that show that Spain is left behind. The train travels much faster. Smoking is not indulged in with the same unrestrained freedom, and spitting at random on the floor is checked by prominent notices calling travellers to a sense of their duty to the public health and to the feelings of other passengers.

The Medoc is the first wine-producing centre I visited in the course of my rambles through the vine-growing regions of France. That favoured district stretches along the left bank of the Gironde from the point where the Garonne and the Dordogne meet, and extends in a north-westerly direction almost to the point where the great river empties into the Bay of Biscay. One type of wine alone is made in that district. In France it is known as "Medoc," after the name of the locality in which it is produced. In England it is, along with wines of the same type, called "Claret." Of Medoc, there are a number of classes, arranged according to the relative proportion of the four grapes which constitute the component parts of the wine, and according to the nature of the ground on which the vineyard stands. Thus, a preponderance of Cabernet, Merlôt, Verdôt, and Malbec, in these respective orders, influence quality, which is more or less accentuated according to whether these grapes come from the gravel slopes or from the richer flats which form the river bank.

The ruling of trade, which is only the reflex of popular favour, has introduced for Medoc wines a classification mainly based on these two conditions, which have come to be universally accepted.

The quality of these wines has been standardised, and each of the three score or so of Medoc growths, known in France as "Crûs," has been classified amongst first, second, third, fourth, or fifth crûs, and likewise sell at prices similarly arranged.

Of first crûs, there are only four, which sell at the vineyard for an average price, according to season, of £150 the ton of 224 gallons. The names of Chateau Lafite, Chateau Margaux, Chateau la Tour, Chateau Haut Brion are well known to all lovers of high-class clarets.

The other classified crûs sell for £100, £70, £60, and £50 respectively per four hgds. of 55 gallons, which make up a ton. In other words, Medoc wines of the favourably known growths sell a few months after vintage for an average price of 13s., 9s., 6s. 3d., 5s. 4d., and 4s. per gallon respectively.

Besides these classed growths, there are well-known crûs, which have also been classified into:

Crûs Bourgeois,
Crûs Artisans,
Crûs Paysons,

and which sell first-hand, on an average and according to season, for £40, £30, and £20 per ton of four hgds., or, in other words, 3s. 7d., 2s. 9d., and 9d. per gallon, when a few months old.

The Medoc, together with many other districts of France, fared badly this year at the hand of the weather, and in places I could see the dried-up grapes left unpicked on the vines. Indeed, spring frost, wet weather, hail storms, mildew, and other fungoid diseases all vied in seasons to effect the complete destruction of the grape crop.

What efforts were put forward and were required to save from the repeated onslaughts of the elements and of blights combined, what grapes were converted into wine, is best understood after a visit to the locality referred to. This I did when going down by boat to Panillac, which adjoins the well-known communes of Saint Julien, Saint Estiphe, Margaux, and Cantenoa, where for kilometres after kilometres one meets nothing but vineyards, kept in good trim, extending on each side of roads as smooth as garden paths. Whilst there I took the opportunity to make a fresh pilgrimage to some of the best known *crûs*. So conservative are they in Medoc that during the 12 years or more that have elapsed since I was there, not one single improvement of more recent years could I find. The same slow bullock carts, drawn by big dun oxen working under light canvas covers; the same treading platforms, whence half crushed grapes are thrown by means of wooden shovels or by hoppers strapped on the shoulders, into the fermenting vats; the same methods of making wine which, after patient and slow evolution, have been proved best adopted to local conditions.

This year whilst the communes extending from Margaux towards the sea have gathered a vintage which for quantity and quality is quite up to the average, those other communes nearer Bordeaux have not fared so well, and indeed the vintage which promised to require several weeks to effect did not take as many days to bring to an end.

My intention being to visit more thoroughly that part of Southern France known as the Midi, where high production rather than quality is aimed at by vinegrowers, I found myself compelled to give up the idea of visiting once more well known wine-making regions which are within easy reach from Bordeaux and are known as the *Graves*, the *Palus*, and the *Sauterne* districts.

DUTIES ON IMPORTED WINES.

Bordeaux, together with Cette and Marseilles, is one of the chief ports of exportation as well as of importation of wines and of spirits. Although France is a large exporter of that commodity, she also imports, in seasons of shortage like this, no inconsiderable quantities of foreign wines, which is worked up with the local article into general consumption. At other times she also imports from abroad special wines for the concoction and manufacture of particular kinds of liquors and of wines for the export market.

The duties levied, amount to 25 francs per hectolitre (22 gallons) on such wines made from fresh grapes and containing less than 12 per cent. of alcohol (11¼d. per gallon).

The bulk of our West Australian dry wines would come in at that rate. On stronger wines, and for every individual degree above 12°, the duty levied on spirits is charged in proportion to the excess allowed, *i.e.*, 2 francs 20 centimes for each such degree, the full duty being 220 francs per hectolitre of spirits computed at 100°.

Casks enter free, but bottles are taxed to the extent of four francs 50 centimes per 100 kilos., half the gross weight of a one-dozen case being reckoned as bottles.

Each parcel is besides subject to a 10 centimes' statistic duty.

These duties apply to wines imported from abroad, but wines from all European countries, including England, are, in addition, subject to a tax of three francs 60 centimes per 100 kilos. gross weight. To those have to be added landing and other charges, amounting to about two francs. Special trouble is taken to ascertain whether the wine has been treated with plaster of Paris, any amount of sulphate in excess of two grammes per litre being prohibited.

This, in a nutshell, appears to be the extent and the manner foreign wines are taxed when entering French markets.

Whilst at Bordeaux I had opportunities of meeting wine merchants and brokers. One and all of them take a keen interest in the evolution towards the policy of protection in self-defence, initiated by Mr. Chamberlain. They do not disguise to themselves the effect such a policy would have on the wine and spirit trade of France, and they realise the danger for them of the growing import into England of colonial wine, as well also as the potentialities which Australia and the Cape offer for supplying the British market.

The Midi as regards wine production takes the lead of all the wine-growing regions of France, although on the foreign market it is outclassed by the clarets and white wines of the Bordelais, the burgundies of the Rhone Valley and of the Côte d'Or, the champagnes of hillsides of Rhein and Eperney and the brandies of Cognac.

The Midi comprises all those provinces which border on the Mediterranean from the Alps to the Pyrenees. It is the region of great production where the one object is to obtain at a low cost a liquid of suitable alcoholic strength. It is the wine which is consumed by the bulk of the population. Whenever it is exported it is more often disguised by means of clever manipulations and of deceptive brands and palmed off as the production of the more aristocratic regions. In this respect Cette has achieved a notoriety which is only surpassed by Hamburgh where alteration is raised to a fine art.

The Midi has now recovered from the ravages of phylloxera, and the sap-sucking insect is now dreaded no more than is the woolly aphis by Australian apple growers. Valuable time, amounting to years, has however been spent in vain conjectures and sterile experiments in the efforts of vine-growers to fight the insect until the Government hit on a practical way of dealing with it. After whole vineyards had been destroyed, their proprietors ruined and villages impoverished through the calamitous introduction of the insect, an effort was made to fight it with nature's own arms. What Western Australia has initiated of late years for fighting farm and orchard pests, France attempted to do as far back as a quarter of a century past, when Planchon discovered the phylloxera insect on dying European vines as well as on thriving American vines growing side by side. That scientist was, as a result of the discovery, commissioned to the new world in search of nature's methods of fighting the blight, and the result of the investigations has come up to the most sanguine expectations. A moribund industry, one of vital importance to a once rich country, was galvanised into life again. With the discovery and the introduction of the phylloxera-resistant vine stocks prosperity and affluence were restored to the land.

Since then phylloxera-resistant vines in their numerous varieties and sub-varieties have been worked for all they are worth by enterprising nurserymen. Until now, out of a list comprising over a hundred sorts and their numerous hybrids, only three or four have been found to embody the features of resistance to the attacks of the insect, adaptation to soils of widely different origin, and readiness to take the graft.

Foremost amongst these is the *Rupestris du Lot* or St. George (also called *R. Monticolo*), which I introduced into Western Australia a few years ago. This vine is a general favourite for gravelly, sandy, and dry soils, provided they be deep, as it strikes its searching roots almost vertically downwards. Next to this is, for shallower soils, fairly moist and rich on the surface, *Aramon Rupestris Ganzin* No. 9, which of late has come forward very prominently and superseded other sorts on such formations. Next in importance is the *Vitis Berlandieri*, which, on limestone formations, is less subject to chlorosi than any other American vine.

Whilst at Montpellier I availed myself of the opportunity of paying frequent visits to the plots of specimen vines gathered from all possible sources. Such a collection is, I believe, unique, and as I had the good fortune of seeing it when the grapes were ripe, it proved of particular interest. One striking feature is the plot planted with hybrids, amongst which it is thought *producteurs-directes*, or, in other words, phylloxera-resistant vines, producing good marketable wine without grafting, may be found. Hitherto the wine from even the most promising of these hybrids has not come up to the desired standard, although marked improvements have been effected by means of cross fertilisation and of selection.

Considering the excellent results obtained from the union of well-tried and valuable European grape vines on some of the resistant American wild vines, it would seem as if the amount of patience, industry, time, and money as well would not be more profitably spent in working out answers to problems of everyday occurrence.

DETERIORATION OF FRENCH WINES.

Wherever one goes one cannot help noticing the regretful way consumers speak of the gradual falling off in the quality of the bulk of French wines when compared with those of years past. Nor are these remarks confined to consumers alone, but dealers also at times admit that their new purchases don't keep and improve in their cellars as their goods used to do.

This tendency is more noticeable in the cheaper wines of the Midi, where the changes which have been effected subsequent upon the destruction and the replanting of the vineyards have been more radical in their results than they appear to have been in those districts where the choicer wines are produced.

One reason of this falling off in quality has been the substitution of the more productive vines for those vines producing a more delicate wine, and one possessed of superior quality, which once grew in a number of vineyards.

Thus nowadays Aramon, the Terrets, and the Bouschet hybrids, which yield a prodigious amount of grapes, producing a wine deprived of character, nerve, and keeping qualities, have ousted the Carigane, the Morastel, the Mataro, the Grenache, the Aspiran, and the Picpoul, which, before the phylloxera, were much more cultivated than they are at present.

All this group of vines—either individually or blended amongst themselves—produce wines of superior quality to those of the first group, of which married and blended with these wines imparted to them some of their own character.

Other causes of deterioration of French vines are the various fungoid diseases which of late years have assailed them. These diseases not only attack the vines in the leaves, which are their breathing organs, but some also settle on the branches, and cause them to rot. Constant vigilance, and the timely application of fungicides are necessary to protect the vines; and, moreover, art is too often called in to correct in the ferment vat, with the aid of chemicals, what unfavourable seasons or disorganising fungus blights have done to the juice of the grape. It stands to reason that any such addition—in order to correct defect inherent to the juice—cannot be as beneficial to the resulting wine as if nature in her kindness had provided that juice with all its essentials in evenly-balanced quantities; but it unfortunately too often happens that unkind responsibility of correcting nature devolves upon growers untrained for delicate laboratory manipulations.

Wines produced by grapes of indifferent quality, and made according to rule-of-thumb methods, for obvious reasons often fail to keep.

Modern tendency towards Quantity rather than Quality.

A ramble through the vineyards of France impresses one that when engaged on the work of replanting the vineyards not long since ruined by the phylloxera, heavy yields more than a higher standard of quality influenced the choice of the vineyard proprietors. Those choicer grapes, which once were instrumental in winning for the wines of France that fair fame which made it known all the world over, were discarded for the heavier bearers. Quality was sacrificed to quantity. In the days when the production was far short of the consumption, and heavy drafts had to be made from foreign sources, anything that was sound, highly coloured, and alcoholic found a ready sale.

Wine was not sold at so much a cask, according to locality and individual merit and quality, but at so much the degree of alcohol per 100 litres or hectolitre. The problem, therefore, which had to be solved was the production from a given area of ground of the greatest number of hectolitres of wine of as high an alcoholic degree as possible. In solving this problem, the substitution of heavy bearers for less productive but better quality vines, and the more general use of chemical fertilisers to still further increase the yield. It became apparent that a yield of 100 hectolitres of wine of 10 degrees strength selling, say, for one franc the degree, and worth, therefore, 1,000 francs, resulted in larger profits than that of 50 hectolitres of 12 degrees wine worth 1 fr. 50cs. per degree, and represented a net profit of 100 francs.

Unfortunately the by far too general application of that reasoning has resulted in the lowering of the standard of the wines of to-day; added to this the deteriorating influences of diseases and blights which have since invaded the vineyards, and which find in the climate of France congenial conditions for their propagation, and there is little cause for wonder why, wherever one goes, the consumer complains that the bulk of French wines nowadays compare unfavourably, both as regards good keeping and good quality, with wines once made in the same locality but under different conditions.

In Western Australia, on the other hand, we have aimed at planting nothing but the choicer grapes ; and the average yield per acre is in consequence somewhat low. Our present mode of extraction, and inefficient presses, still further lowers that average. With greater competition in our home market from the Eastern States, and in view of the exportation abroad of the surplus of our production at some date not far distant, it would be well when adding to our vineyards to pause and select, amongst a number of suitable varieties, such as would, under the conditions which prevail with us, increase that average without in any noticeable way lowering the high quality it is reasonable to expect of wines made from grapes such as we have at present growing. Amongst these, "Carignan" and "Morastel" are held in good repute in the vinidi of France, and as they have proved well adapted for the warmer districts of Western Australia, I would prefer them to the "Mataro," which does not give with us the same heavy crops as in the Eastern States, while, as regards quality of the wine produced, they are also superior to the latter.

SHORT SUPPLIES AND HIGH PRICES.

Owing to a run of bad luck, and mostly to unseasonable weather, aggravated by severe attacks of blights of various kinds, barely one-fourth of the crop of grapes has been made into wine in France. Had it not been for the bounteous vintage gathered in Algeria, a wine famine would have been experienced. Even with that help in time of need from the African colony, things looked rather gloomy, and extensive purchases are being made abroad, and chiefly in Spain, to fill the gap. At this juncture, the State bounty-fed beet-sugar refiners of the North succeeded in gaining for themselves an advantage which must ultimately work greater injury to the Southern provinces wine-growers than did the phylloxera and all the other blights combined. Advantage was taken of the half-demented state of mind of the wine-producing South, where at one time a complete failure of the vintage was contemplated, to introduce the thin edge of a weapon which may cause considerable harm to the good repute of French wines in general.

Arguing from the fact that stress of weather and attacks of the mildew, of the brown, the grey, and other rots which affect the grapes would militate against their proper ripening, strong pressure was brought to bear on the Government to introduce a Bill authorising vinegrowers to strengthen in certain proportions the thin, sickly juice of their grapes by means of the addition of sugar. A few Southern deputies were found to support this attempt. Some stoutly denounced it; others did not interfere, and the Bill was passed. It means for the beet-sugar refiners a fresh outlet for their goods. Of course, elaborate regulations were drawn up to see that the alleged privilege is only used to a certain extent; but, as it is well-nigh impossible to see that fraud, which the Bill invites, is not practised extensively, the South now at last recognise that they have been imposed upon, and that, besides strengthening the grape-juice up to a desirable standard, the vintage of the country is being fraudulently added to by the addition of solutions of sugar in water.

Of course, whenever these frauds are discovered, prosecution ensues and fines are sometimes inflicted, but when one remembers that in France every owner of a patch of vines also makes his own wine, and that the poorer the winemaker the greater is the temptation of adding to his output, particularly in a season when anything in the shape of wine sells, it is permissible to inquire whether a number of cases of fraud are not perpetrated which are never brought to light.

As time goes on, there is no question as to whether this innocent sugaring Bill will throw some amount of discredit on French wines which they can ill afford, as in winemaking more than perhaps in any other industry, honesty is the best policy.

Press-houses Sumptuous or Sordid.

Wherever one goes in the southern provinces of France, the eye meets horizons of vines. No line of demarkation, no manner of fences separate one vineyard from another, yet hundreds of proprietors may own whatever extent of vines unrolls before the eyes. Stones set in the ground serve as landmarks, and limit each man's property, which, moreover, is minutely inscribed and delineated in the "Cadaztre," or rate-book of the "Commune." Here and there among that ocean of vines one sees a copse consisting of shady trees, which often surround the stately country residence of a rich proprietor, and is sometimes by courtesy called his "chateau." If that vineyard proprietor is wealthy as well as progressive—and there are a number of such who for generations have owned the land they occupy—they also take pride in having a press-house and cellars fitted up with the most modern and up-to-date appliances. Some of these press-houses which it has been my good fortune to visit are sumptuous and most complete in every detail, and have been designed and fitted up in a style which leads one to think that if vinegrowing offers little or no profit in bad seasons, it must, on the other hand, at times prove eminently remunerative. More especially in the department of the Herault did I see cellars which surpass anything I have seen in Europe. Steam and hydraulic power are made to perform all the operations of elevating, crushing, and vatting the vintage, of pumping the wine, pressing the skins, and doing mechanically all that was at one time done by hand labour. As the quantity of grapes these cellars receive is enormous, the cost of handling is thus materially cheapened, while a great economy of time is at the same time achieved, and the whole operation of wine making is performed with the most scrupulous cleanliness.

From these sumptuous cellars to the villages close by, where every peasant who owns a patch of vines makes his own wine, the transition is striking.

In France, where land property is divided and subdivided to a most wonderful extent, the rural population finds it more economical to live in villages. In mediæval days another cause militated towards driving the people together, viz., the internal wars of religion which raged in those days, compelled the inhabitants, in self-defence, to flock together inside small villages built around some fortified castle or monastery, whence they could repair and defend their homes, or issue forth and raid the country around. A great many of these villages show evidence of these troublous times and a walk along their tortuous, roughly-paved lanes, accompanied by someone acquainted with the past history of the country, is very interesting. In these villages folk-lore swarms, as do also a busy population of men and women, surrounded with crawling children and all kinds of farm and domesticated animals.

The most elementary rules of sanitation are either ignored or never enforced, and all the interest awakened by the legends of each striking monument is often neutralised by the desecration of these monuments by the living survivors of the people whose exploits are croned to every child in the cradle.

At vintage time, these villages are the scene of greater animation than usual. Each peasant picks his own grapes, carts them to his own place, where there is already hardly room for the occupants of the house. The poultry is temporarily banished from under the casks, and there is an atmosphere often strongly scented with the emanations of the dung-heap outside the door, or of the stable close by. The grapes are converted into wine in rule-of-thumb fashion. Whilst still new, that wine is sold for whatever it can fetch to the wine merchant, who sees that no harm comes to it, whilst the peasant himself utilises for ordinary home requirements a light piquette manufactured from the pressed skins.

The Climate and the Vintage Time.

Indeed, for one with some experience of winemaking in hot climates, it is almost marvellous that a marketable wine can be made under conditions apparently so inimical to a healthy fermentation. With us, whenever grapes are handled in the same crude fashion, the result is only too often disastrous to the soundness of the wine which, even as it runs from the press, festers with germs of maladies.

In Algeria local experience runs much on Australian lines, whilst in France, where grape-picking commences later in the autumn, and takes place in cooler latitudes, the temperature during wine-making is in every respect an ideal one for the safe conversion of grape sugar into grape spirit and the other constituents of wine. During vintage in the South of France, a night temperature of 60 degrees to 65 degrees F. is often experienced, whilst it rarely happens that the temperature of the grapes, etc., freshly vatted, exceeds 70 degrees to 72 degrees F. In addition, when it is remembered that the natural acidity of the grape itself is two to three per mille greater than with us in Australia, and is therefore favourable to a healthy fermentation and inimical to the rapid development of germs of diseases.

In the more northern latitudes, such as are met with in following the vintages up the valley of the Rhone and beyond to the Maconnais and the Beaujolais, these favourable conditions are even more pronounced, and contribute materially to the excellence of the wines made on the sheltered slopes of these well-known localities.

Vintage a Period of Bustle and Work.

The country side in the South of Europe probably never looks to better advantage than during vintage.

As soon as ever the first vat is filled, and until all the grapes are picked, a kind of vertigo seizes the whole rural population, and the greatest activity reigns wherever one goes. Nor is Sunday an exception to this. In Spain, apparently one of the most religious countries on the face of the earth, Sunday forms no exception, as regards fieldwork, to any other day of the week. In France, the population in ordinary time seek in amusements a diversion for the monotony of the daily work of the week. At vintage time, however, the work goes on as merrily on Sundays as it does on any other day; and as the railway time-tables recognise no Sundays, it is hard to imagine, when one arrives at one's destination in the country on that day, that it is Sunday at all.

The fact is that in vintage is crystallised all the work, the worries, the outgoings of the year, and that long association with the fickle European climate has taught people that the weather often turns nasty towards the end of vintage, and that smartness of operation almost invariably averts disaster towards the end of the grape-picking season.

At the time I left, the Herault vintage was on its last leg, and indeed the gleaners had already swarmed over the broad acres of vines, picking any overlooked bunches or any grapes which were too green at the time of picking; yet after a heavy thunderstorm the river, swelled by its feeders from the mountainous country inland, had in part overflowed its flat, alluvial banks; and it certainly was a picturesque sight to see the gleaners, mostly women and children, trudging in mud, with tucked-up dress, amongst the vines, picking here and there whatever grapes were left hanging on the bushes.

There is little that is wasted in France, and as everyone works in the rural district, women as well as men, the whole countryside has an appearance of thrift which is not without its charm.

IN SEARCH OF PARASITES.

Report by G. COMPERE.

THE ACTING DIRECTOR.—I herewith beg to submit the following report in connection with my recent mission to India in search of parasites of the fruit-fly *Ceratitis capitata*, Wied. In its preparation I have endeavoured to make it as explicit as possible, so that you may see the exact position arrived at in this matter, in doing so I found it necessary to refer to my former report in connection with my trip to the United States of America and the Mediterranean region. When it was decided by the then Hon. Minister for Lands (Dr. Jameson) to send me to the Mediterranean country in search of this parasite, I then pointed out to him that in order to secure the true parasite of this fly we would first have to locate its native home, and also remarked that wherever this should be there the parasite would be found. Up to that time all the literature bearing upon this particular species of fly showed it to be a serious pest in every country from which it had been recorded. From these published accounts it apparently attracted public attention first in Spain by its destructive work, and soon spread over the whole of the Mediterranean country, and from there to the East Indies, Cape of Good Hope, Australia, and other countries, and soon became known as the Mediterranean fruit fly. In none of the published accounts of its occurrence in other countries gave the slightest clue as to its original home. I realised then that the task of locating the place it was indigenous to would be a difficult one.

After many days of studying out a plan on which to begin the search, I concluded to first visit the Philippine Islands, as Spain might have received the fly from these islands; failing to find it there then to visit the Department of Agriculture at Washington, U.S.A., and search the records there to see if the fly had been received from any other country aside from those mentioned in their reports. At the Philippines I was prevented from landing owing to cholera there at the time. Reaching Washington, I at once called upon Dr. L. O. Howard, chief of the division of entomology, who informed me that everything of importance concerning this fly in other countries which they had received had been published and which I had perused. Thinking the matter over, I decided to call upon Prof. Coquillet, one of the assistants of the division, and the best authority we have at the present on flies. Looking over his collection nothing was discovered, but on turning to his note-book a small slip of paper was found on which was recorded the fact that about two years previous to my visit he had received a specimen of the fly from Dr. H. Von Ihering, Sao Paulo, Brazil, among a lot of other insects sent to the department for identification. This specimen was numbered 575, and was identified by Prof. Coquillet as *Ceratitis capitata*, Wied, the same species as we have here, specimens of which he had on hand, so that there could be no mistake on that point. Dr. Von Ihering, requested the return of this specimen, and had stated in his letter to the department that it had been reared from an orange. Having secured this information, I at once called again upon Dr. Howard, and requested to see Dr. Von Ihering's letter, but this had become lost, but they were able to furnish me his address. From the fact that the sender requested the return of that specimen, indicated to me one of two things—one that the fly was an uncommon one there, the other that he had secured it from an orange coming from some other part of the world.

Upon reaching New York, I at once addressed the following letter to Dr. Von Ihering:—

New York, 9th March, 1903.

Dr. H. Von Ihering, Caixa Do Carreio, Sao Paulo, Brazil.

Dear Sir,—While in Washington the other day, I was informed by Dr. L. O. Howard, chief of the division of entomology, that you had about two years ago sent specimens of a species of fruit fly to him for identification, No. 575. This was identified as *Ceratitis capitata*.

Being very much interested at the present time in securing information about this particular species of fly, I have taken the liberty of addressing you upon the subject. The information wanted is how long has this fly been known to exist in your country? What fruit has it been found to attack? and is it considered a serious pest there, as it is in other countries where it has become established? If so, what methods are employed to check it? Any other information which you may be able to furnish with reference to its habits there will be highly appreciated by myself and the Government of Western Australia. This fly has become a very serious pest in some of the Australian States, and I am now on my way to the Mediterranean region to see by what method it is handled there. Thanking you in advance for your kindness,

I remain, very respectfully,
Geo. Compere.

Address letter c/o Department of Agriculture,
Perth, Western Australia.

Reaching Spain, my attention was chiefly given to ascertaining, if possible, from what direction that country had received the fly from, but upon this point absolutely nothing could be obtained; but there were plenty of growers who were positive that they well remembered the time when such a thing as maggots in their peaches, nectarines, oranges, and other fruits was unknown. This indicated to me, beyond a doubt, that it was an imported species to that country, and not, as many claimed, a native of that region.

Returning to Perth, I anxiously awaited a reply from Dr. Von Ihering to my letter to him of March 9th, and, after waiting six months from the time of writing, and receiving no reply, I gave up all hope of receiving any, and left again on September 14th, for

India, to continue the search in that country. Failing to find it there, it was my intention to again visit the Philippine Islands. They having been in Spanish possession for more than a century, thus bringing them in direct commercial communication with Spain, I thought it likely that with the introduction of tropical fruits from those islands to Spain the fly could have easily been introduced.

October 10th, I arrived at Calcutta, *via* Poona, Nagpur, and other places. There I found the following letter from Dr. Von Ihering, in reply to the one I wrote from New York, under date of March 9th, 1903:—

Sao Paulo, Brazil, 25th July, 1903.

Museu Paulista.
Director Dr. H. Von Ihering.

DEAR SIR,—I have received your letter of the 9th of March. The fruit fly to which you refer is not here so frequent and pernicious as in your country. *Five or six years ago this fly has been observed in S. Paulo; nevertheless it has not much increased till now.* I have found in oranges chrysalis of *Ceratitis capitata*, Wied, of the family *Trypetidæ*, a species of a vast distribution geographical. Another species of the same family, *Anastrepha fraterculus*, attack *psidium guava*, *guagava raddi*, and coffee berries; another similar species, *Trypheta bisenata*, Loen, produce gall nuts formed by swellings of the branches of a sylvan species of vemonia, which is very frequent here. I am sorry that I cannot send you my paper about this subject published in the *Revista Agricola*, Sao Paulo, 1901, because I do not possess any more copies of it. It will be interesting for me to obtain your paper containing the results of your study, especially with regard to the respective treatments. I have recommended as one of the most important means the rapid collection and destruction of all fallen fruits.

(Signed) H. VON IHERING.

When I learned at Washington that Dr. Von Ihering requested the return of the specimen sent there for identification, I then surmised that the species was either an uncommon one, or that the fruit from which it had been reared might have come from some other country, and so stated in my report which appeared in the August number of the *Journal*, 1903, page 141.

Had Dr. Von Ihering's letter reached me before I left for India, I should not have gone there, but to Brazil instead, as that is without any doubt in my mind the native home of this fly, and it is there that we can secure its true parasite.

The plan of visiting Washington, to search the records, has proved the correct one, for had I not done so we would not now be in possession of the information we have concerning its occurrence in South America, and I do not now hesitate to say that, when we have all the facts before us, that Spain received it from that country, the whole of that section being more or less Spanish.

Fruit Flies in India.—Previous to my leaving for India, I only knew of the existence of three species of fruit and vegetable flies in India, one being *Revellia persicæ*, Bigot, a technical description, and notes on its life history was published in 1890, Vol. 1, No. 4, Indian Museum Notes, and at that time causing some amount of damage to peaches in the Chota Nagpur district. Another was *(Dacus ferrugineus)* Bigot, and had been recorded as a Mango fly, and then only as infesting decaying fruits. The other was a vegetable fly *(Carpomyia parotalina)* Bigot, an account of which appeared in Vol. 2, No. 1, Indian Museum Notes, and known as the Baluchistan Melon fly, but had also been found in cucumbers and vegetable marrow. Arriving at Bombay, 28th of September, I at once visited the Crawford Markets, in which all the fruits and vegetables consumed in Bombay and suburbs are handled. There I learned that the principal districts from which they drew their supply of fruits were Poona, Kuivla, Nagpur, Bangalore, and Mysore, some pears and apples from the Dargiling district. Any number of the fruits and vegetables exposed for sale showed signs of having once been punctured by fruit fly, but only a very small per cent. contained any traces of maggots. During my stay in Bombay I discovered fruit fly maggots in the following fruits and vegetables:—Oranges, limes, mangoes, peaches, guava, two species *(Psidium cattleyanum, Psidium guaiava*, natives of Brazil and tropical America), cucumbers *(Cucumis sativus)*, egg plant *(Solanum esculentum)*, vegetable marrow, and various other species of gourds, and musk or scented melon. Having secured maggots from all these fruits, and placed them in breeding tubes, I left Bombay for Poona. Going to the gardens there, any number of fruits could be noticed hanging upon the trees which had been attacked by fruit fly, and some contained as many as eight punctures, but it was an extremely difficult matter to find a fruit which contained living maggots. This was accounted for by the presence of a small *(Chalcid)* fly, which is without doubt the most effective parasite of the fruit flies in India. There are many species of them in that country, and are so small that they are scarcely discernible to the naked eye. These are egg parasites, and it is indeed interesting to watch them running over the fruits searching out fresh punctures which contain the eggs of the fruit fly, and when one is located they will at once oviposit in the same puncture made by the fruit fly. Should any of the eggs of the fruit fly have hatched before those of the *Chalcid* the latter will in that case not destroy them, and they will at once begin to work their way to the centre of the fruit. But here again they are met with another of nature's checks in the form of an *(Ichneumon)* fly, which, with her long ovipositor inserted in the opening made by the maggots for an air chamber, will deposit her egg in the living maggots. The eggs of these *Ichneumon* parasites soon hatch and begin feeding upon the fruit fly maggots, the effect of which they soon feel, and then if full grown or not, will at once leave the fruit, falling to the ground below, in which they will burrow to the depth of from half to one and a half inches and there pupate. Their pupa shells act as a covering for their enemy, which passes its life, from egg to adult, inside of the fruit fly maggots. Then there are other species of *(Ichneumon)* parasites, which at first appearance could be easily mistaken for small ants. These will enter the fruits no matter how much decayed the fruit may be. These will search all through the rotten pulp for any maggots which may have escaped the attention of the other species, and whenever they locate a maggot will at once attack it, and deposit as many as 16 eggs in a single maggot. Maggots so attacked will at once leave the fruit, presumingly to escape the attack of the parasites, and in most cases it would be noticed that when the fruit fly maggots emerge from the fruit the little parasite would yet be attached to them, but would let go its hold on reaching the open. Leaving the maggot, they would at once begin to clean and dry themselves. This accomplished, they would at once re-enter the fruit in search of more maggots. There is no doubt but that the habits of these parasites coming to the surface attached to their prey is a provision of Nature by which they are rescued from within the rotten mass of pulp. At Kuivla, in an orchard of sweet lime trees, where there were thousands of the fruits to be noticed which had been attacked by fruit fly, these limes when once punctured would begin to decay and soon fall from the tree. Two species of flies were noticed in the act of attacking the limes in this district; but notwithstanding the thousands of punctured fruits found there, in not a single instance was any found which contained live maggots, but from fruits taken from the tree in which the flies were noticed in the act of ovipositing were in less than a week a living mass of maggots, and from which two species of fruit fly were reared. Oranges in the same gardens as the sweet limes were also found to have been punctured by the flies, but these did not decay like the sweet limes, but would continue to grow, apparently not much the worse for having been attacked by the flies, only that wherever there had been a puucture there would remain a small depression on the fruit, which in most cases would turn yellow, while the balance of the fruit would remain green, and it was not uncommon to notice single fruits which contained as many as eight of these yellow depressions in the skin.

The next place I visited was Nagpur, where about the same conditions were noticed. There, however, only one species of fruit fly was seen, on citrous fruits, and none of the punctured fruit contained maggots. In the vegetable gardens in and around Nagpur two species of flies were found to attack cucumbers and vegetable marrow; these, the same as with those on the fruits, were attacked by parasites of different species, one of which was an egg parasite.

Leaving Nagpur, the next stop was made at Calcutta. There the public markets were well stocked with fruits and vegetables, being supplied from the same districts as Bombay, and I was able during my stay there to secure quite a number of fruits and vegetables containing maggots. and in addition to the varieties found infested with maggots at Bombay, I secured some pears which had been received from the Dargiling district, and also found an alligator pear *(perse gratissima)* which contained maggots, but was unable to learn where the fruit had been grown. In connection with the pears received from the Dargiling district, it might be well to mention that during this present season a great deal of damage had been caused in that district to pears. Mr. Stebbing, the Government entomologist at the Indian Museum, Calcutta, had given the matter some attention, but from the material he was able to collect and correspondence with the department at Washington with reference to it, he was unable to arrive at any conclusion in the matter. The pears, like the sweet limes at Poona and Nagpur, would begin to decay when once punctured by the flies. When I explained to Mr. Stebbing that I had secured pears in the market which came from the Dargiling district and contained fruit fly maggots, he was then able to account for the trouble, and informed me that up to the present he had had no complaints about fruit flies doing any damage, consequently he paid no attention to this family of insects. The above is a good illustration of what these little parasites accomplish. In this instance they destroyed the evidence of the fruit fly to such an extent that it baffled trained men. In the market where I secured the pears containing the maggots there were many baskets full of pears, of which more than 25 per cent. had been struck by the fly, and some contained as many as six punctures; but in only three was I able to find any maggots. These, no doubt, had been picked just after being struck by the fly and before the parasites had discovered them. Had they been allowed to hang on the tree for a few days, or perhaps only a few hours longer, they would also have been free of maggots. The flies reared from these pears proved to be *Dacus ferrugineus* Bigot. In the collection of insects at the Indian Museum at Calcutta many species of fruit flies were noticed, but the most of them had not yet been described or named.

Leaving Calcutta, the next place I visited was Madras, and by the time I arrived there the flies from the maggots collected at Bombay began to issue, and I found that there were many species, and among them I recognised at least one species *(Dacus cucurbitæ* Coq.,) which has become a most serious pest to melons and cucumbers at the Hawaiian Islands.

In the markets at Madras very little fruit was handled, and the only fruit noticed there as having been attacked by fruit fly were the guavas, and these all came from the Bangalore district, which I next visited. There it was just as difficult to find fruits on the trees containing maggots as at the other places above mentioned, but many different species of flies were noticed attacking the various fruits; one was noticed ovipositing in a grapeberry, and another specie was reared from maggots taken from wild fig. After looking over the gardens at Bangalore, and having some boxes full of fruits containing maggots taken from the City Markets at Calcutta, I made up my mind to try an experiment; this was to visit the orchards and capture any parasites which would be noticed looking for fresh punctures upon the fruit, and during four days no less than six different species were captured, and about thirty-five specimens all told. These, when placed in jars containing maggoty fruit brought from Calcutta, would at once begin to attack the maggots, and in two days' from the time the last parasites had been placed in the jars about all the maggots had left the fruit and pupated in the bottom of the jar; removing and examining the fruit only seven living maggots were noticed. Placing the pupa in small boxes I at once started for Colombo, so as to place them in the cool chamber of the first steamer before they would hatch; but before I was able to place them on the steamer a great many of the pupa had become mouldy; but by cleaning them I managed to save quite a number, from which parasites issued since my return, and most of which were liberated in the open, and some in jars containing infested fruits. Whether these will attack our species of fly or not I am unable to say, but from what was noticed while in India it is very evident that each species of fly has its own particular species of parasites; but any of them, in the absence of their own food, may attack other species in order to perpetuate their own kind, and accomplish a great amount of good. Of the little egg parasites none were secured, as the eggs of these hatch in a few hours after being laid, and to get living specimens over here a person would have to go prepared expressly for that purpose. These egg parasites are without question the most efficient. It must be remembered too, that in India Nature's chain is complete with not a link missing, what maggots escape the attention of one species will be ocated and attacked by others.

During my short stay at Colombo, I discovered no less than four new species of fruit and vegetable flies. One species infests oranges, another the fruit of Zizyphus jujuba, one specie attacks the chillie peppers and egg plant fruit (*Solanum esculentum*), the other infests the Luffa, a genus of cucurbitaceæ. I had no time while in Colombo to study the parasites of any of these four species, and all infested fruits secured there were from the public market and school gardens. Mr. C. Drieberg, superintendent of these gardens, did not know what was causing the damage to the fruits growing in the garden until I pointed it out to him.

In conclusion, I will state that during my short stay in India and Ceylon, I reared over 20 species of fruit flies which are new to science. And no doubt when Brazil is looked over many more unrecorded species will be found there, together with their parasites.

30th November, 1903.

LECTURES ON BACTERIA

(continued).

The Adelaide University Extension Course.

By Dr. E. Paget Thurstan, B.A., M.D. Cantab.

LECTURE III.

Bacteria as Enemies.

Having, ladies and gentlemen, reached the last stage of my lectures, I propose to-night considering germs as a source of danger to individuals and the community; the means of preventing these perils; the influence the science of bacteriology has had on the views of statesmen and city councillors; and, further, to impress on all that cleanliness is next to godliness mainly because our neighbours' health as well as our own depends on our behaviour. As people crowd together in cities, the danger of the simplest transgression of the laws of health becomes intensified, so that death and destruction would be the penalty of our living together in communities were it not that civilisation enables knowledge to march pace for pace with the increased risk. What an example of this is London! In the seventeenth century, when it was no bigger than Melbourne is to-day, it was the theatre of the black death—the plague in its most virulent form. The horrible panic, the grass-grown streets, the red cross on the doors, the rumbling death cart, and the terrible cry, "Bring out your dead," were an awful penalty for ignorance of the laws of health. What a contrast in the Greater London of the twentieth century, with a population half as big again as that of all Australasia, huddled into a few square miles, yet probably with as good a bill of health as Australia itself, and now able to defy the very plague which so cruelly scourged it two hundred and fifty years ago!

We deal to-night with just the knowledge which has brought about this wondrous transformation. M. Duclaux, whom I quoted in my second lecture, says:—"Germs are the important, almost the only, agents of universal hygiene; they clear away, more quickly than the dogs of Constantinople or the wild beasts of the desert, the remains of all that has had life." This hygiene against decaying matter, and passing on—or rather the preventing of the passing on—of injurious matter, is our subject to-night. The first point upon which I will dwell is the dangers to which the public milk supply is exposed, and the necessity of a stringent supervision of dairies. It so happens that milk is a particularly favourable culture-medium in which to develop germs. You may remember in my first lecture

I mentioned a case in which the germs in a milk supply had been examined from hour to hour, and counted. The number steadily increased as time went on in every case, but the amount of development depended on the warmth. When kept at or near 60° (about our present temperature), the total in each c.c. (20 drops) rose, in 24 hours, from 9,000 to something under six millions; at 95° (about our hottest summer mean), to 50 millions; but between these two extremes (at 77°), to the incredible number of 577½ millions. It is hard to believe that 20 drops of milk could contain such hordes. If mere keeping was the true point, it would only be necessary to warn people against drinking stale milk, for this very sample, which reached 577 millions in 24 hours, at the end of six hours had only become 172,000, and took nine hours to reach one million. But the *danger* of drinking stale milk depends as much on the nature of the germs that have been multiplying as on their total. The bacillus *coli communis* is found in vast quantities in the intestines of all animals: there may be hundreds of millions in a few grains of cowdung. They are the main cause of infantile diarrhœa. Their presence in milk is due to gross carelessness on the part of the milkman. Just as other countries have gone ahead of us in the exact care they bestow on butter-making, so America and other countries have left us far behind in the matter of painstaking attention to detail in milking. To such people the ordinary method of milking is nothing less than disgusting. They groom their cows, clean the teats, and wash the udders and the lower parts of the animal before milking. The milkers scrupulously wash their hands, and put a clean overall over their ordinary clothes, before beginning their task. The cow's tail is tied up, so that the filth upon it cannot be shaken into the pail. They never milk cows in a stall contaminated with manure, stale brewers' grains, etc. The cans should be thoroughly *steam-sterilised*, not merely rinsed, for bear in mind that the cream, being fatty, forms a coating on the sides of the pails. This film of cream would be swarming with germs by the next milking, and these would revel in the new milk. Ignorant people will persist in regarding such minutiæ as mere fads. But indeed it is not so. Careful experiments have been made on the effect produced by inattention to all these details. The milk in a properly sterilised pail contained 165 germs to the c.c., against 4,000 odd in one *ordinarily* clean. Again, the effects of cleansing the udder and rejecting the first few jets of milk, and preventing by every possible method any chance of contamination in the way I detailed above, had the result of reducing the number of 15,500 germs (as counted from the rest of the herd) down to 330. This milk kept sweet for 24 hours longer than the other. Yet another experiment has been carried out. A sterile gelatine plate was exposed to the air for one minute beneath a cow's body, close to the pail, while the animal was being milked. Before the beast was washed and cleansed the germs numbered 3,250; afterwards, only 115. It is plainly impossible for the *consumer* to know whether the dairyman is even decently clean. I fear we cannot flatter ourselves that any milkman in this country comes up to the American standard. We have to rely for this on our civic authorities to protect us; and bear in mind that the dangers of neglect are much intensified here by the warmth of the climate, and that our infants' lives depend during the hot months on the purity of the milk supply. Indeed, inferior as condensed milk is to fresh, in other respects it is safer to use that in the summer time than run the risks attendant on a carelessly supervised public milk supply. You may have read a letter in the *West Australian* from the pen of Dr. Jull, pointing out that the mortality amongst children under one year in the State is 13 per cent.—a higher rate than almost anywhere else. Efforts are being made to form an association to remedy this distressing state of affairs. *Apropos* of this I will quote from a leader in the *Morning Herald*:—

> The appalling loss of infant life in Western Australia is a problem that must be promptly and effectively dealt with. Dr. Muskett, a well-known medical man, has devoted more than ordinary attention to this subject. In one of his works this authority deals most trenchantly with the question, as the following extract will show:—"The total number of deaths of infants under two years of age for the four Australian capitals Sydney, Melbourne, Adelaide, and Brisbane during the nine years from 1887 to 1895, inclusive, amounts to over 68,000. When I say that at least 30,000 of these might have been saved, I believe that I am strictly within the mark. Thirty thousand of these little Australians who have passed into their early graves should be alive to-day with every prospect of reaching mature age." But when it is learned that the dreadful state of affairs depicted by Dr. Muskett compares favourably with the annual infant death-bill in Western Australia, the need for remedial measures of a drastic order will be readily appreciated. The average infant mortality throughout the Commonwealth for 1902 was 98 per 1,000. That of Western Australia stands at the incredible high standard of 148. For the rapidity with which its infants perish Western Australia not only heads the Australian continent, but almost every section of the civilised world. Where 70 babies die in New Zealand, 89 in Tasmania, 100 in South Australia, and 103 in the other eastern States, this portion of the Commonwealth loses 148. The position is as sad as it is discreditable.

If you see *visible* dirt at the bottom of the milk when it has stood, you may at once condemn the milkman. Such milk is sure to contain great numbers of germs. I do not think I could bring myself to tell you what that dirt mainly consists of. Needless to say, the jug the milk is received in must be as scrupulously cleaned—boiled with soda—as the dairyman's churns; and equally necessary is it to urge that baby's bottle requires the same minute attention. When held up to a strong light you must not be able to see in any corner a greasy streak of old cream—the whole surface must be polished *bright.* Pasteur devised a method of temporarily sterilising milk and wine, etc., which is known to this day as "pasteurising." He found that though spores were unaffected that most germs were destroyed, or at least arrested in multiplication for some hours, by being kept at a temperature far below boiling, say 160 degrees, for half an hour. This can easily be managed in private houses by standing the milk-jug in a saucepan of water and bringing the outer water just to the boil, and then standing it away from the hot part of the range to cool down; or the milk in a saucepan may be brought almost to the boil and then put under a tea cosy and left to brew for half an hour. Either way is better than boiling milk, which coagulates the albumen and spoils it. Since Pasteur's time we have found that alternate heating and cooling two or three times is even more effective against bacteria than one prolonged heating, so that if you wished to be more effective you might push your saucepan of milk forward over the fire and backwards to the cool part of the range two or three times while you are pasteurising. If you are using a primus stove you must put out the light once or twice during the preparation. I will now show you an apparatus devised for sterilising milk (Soxhlet). (Fig. I.)

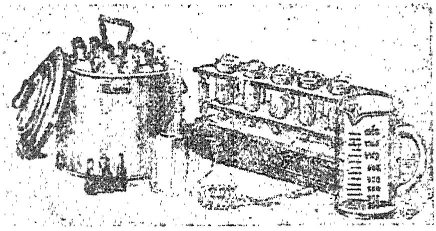


Fig. I.—Soxhlet apparatus for pasteurising milk.

There is another danger associated with the milk supply, and that is the fear of consumption being transmitted from the cow. The bovine race is curiously susceptible to tuberculosis. From France, Denmark, and the United States come similar reports which seem to show that one cow in every five or six is contaminated. Strangely enough goats are almost absolutely exempt. Probably six or eight per cent. of the samples of cow's milk sold in towns contain tubercle bacilli. Koch was inclined, as many of you know, at the recent congress in London, to deny that tubercle in cows was the same disease as tubercle in man; but personally I should prefer not having even cow's tuberculosis. Here again, the consumer is absolutely helpless. The authorities alone can preserve him from danger. God judge the man who, having power and authority, disregards the public health in order to win votes and local support! The germs of typhoid, scarlet fever, and diphtheria are also easily communicated through the milk supply. You see, therefore, that the inspection of dairies must extend to the persons working there. No employee should have the slightest rash or feverish disturbance without being seen by a medical man. I must say in common justice, dairymen ought to be compensated, when they suffer for the public good, out of the public purse. Sometimes purveyors of milk, and indeed of many other foods and drinks, put antiseptics into the milk to prevent it from going bad. This should not be permitted, I think. In the first place, it is used to hide dirty, slovenly work; in the second place, it is too late, when a sample of food is already swarming with bacteria, to put in antiseptics; and in the third, most substances so used are more or less deleterious. The State of Victoria used salicylic acid to prevent badly-made wines from becoming palpably unfit to use, and the result was its wine reputation was injured in London, and South Australian wines are much more thought of. Dairymen use borax, boracic acid, and boro-glyceride more than they do salicylic acid, I fancy.

Bakers, again, by inattention to cleanliness, may have many others besides the yeast-germs at work on the dough. Though the subsequent cooking is said by some to destroy all bacteria, and I do not think any infectious disease could be caught from bread, still sour, heavy bread is very indigestible, and supervision of bakeries is an important part of a city council's duties.

The next point on which I will dwell is the public water supply. For many years sanitarians were occupied in trying by legislation to prevent towns on river banks from pouring their sewage into the stream, because they thus contaminated the water for the people below, who had to draw their supply of drinking water from that river. Considering how many towns there were up river on the banks of the Thames, and that all the millions of people in the great city drank this water, it was surprising that the public health was so good. The Lambeth Waterworks Company used to filter their water through beds of sand, but this was to make it clear and bright, without any thought of bacteriological effects, which indeed were unthought of in the days when the first filter-bed was made. The crenothrix, which I will now show you as one of the micro-organisms in water, is of interest to us in Perth, because we probably have it in our mains as masses of iron-stained slime. Ten or a dozen years ago a severe visitation of cholera befell Hamburg. Now, Hamburg drew its supply of drinking water from the upper waters of the Elbe, *above* the town. Altona, an important suburb, drew its water from the river *below* Hamburg. Under these circumstances you would naturally expect that any water-borne disease would have fallen much more heavily on Altona than on Hamburg. Exactly the reverse occurred. For weeks Altona escaped altogether, while hundreds were dying in Hamburg. What made it more striking still was that there was a little peninsula in the middle of the town which was supplied with water from the Altona mains, and this patch escaped scot-free, while the streets round were full of cases. Subsequent investigation showed that Hamburg drew its water supply from the river unfiltered, while Altona's passed through beds of sand, so that though Altona's drinking water was probably the impurer of the two to begin with, the filtering made all the difference. Now, we know that it is germs living on the surface of the sand that purify the water. A certain length of time has to elapse after the filter bed is made before it begins to purify the water. Later on, when cholera had almost disappeared from Hamburg, it broke out in Altona. The cause was ascertained to be the breakdown of a filter-bed through its having been cleaned out in frosty weather. There is an application of this lesson to ourselves. The water supplied to Perth is sometimes almost too dirty to wash in, much more to drink, showing the possibility of contamination. Most of our supply nowadays comes in summer time from deep bores, which are comparatively little likely to contain germs, but sometimes through a fissure or geological fault even deep wells may become infected. This happened at Worthing, in England, not many years ago, and a bad outbreak of typhoid was the consequence. Reservoirs may become contaminated, as occurred at Maidstone recently, also producing a most alarming epidemic of typhoid. No town in the world can afford to ignore filtration. (Fig. II.)

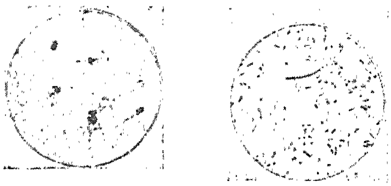


Fig. II.—Germs of Typhoid Fever.

The next point needing attention is the danger that lies in dust. Street-sweeping is a costly affair, and city councils are apt to shirk their responsibilities. I do not see why motor circular brushes should not be used instead of hand labour, which is always the most expensive mode of doing anything.

One sees old men almost beyond work, feebly sweeping the streets. It may seem hard to dispossess them, but it must be remembered that human lives are at stake. The strong young man gets typhoid or pneumonia, the wife gets blood poisoning in the hour of her trial, the children get diphtheria or scarlatina, or other infectious disease. All these things are preventable, and cleaning up the dust promptly is one of the ways of obviating these distressing occurrences. (Fig. III.)

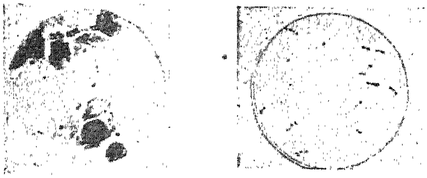


Fig. III.—Pneumonia bacillus.

At present Perth streets, other than the main arteries, are only swept at rare intervals. All the germs of well-known diseases almost are to be found in dust. When cuts "fester," people are apt to think there must have been something specially poisonous about the weapon that caused the cut. This is not necessarily the case. The air in contact with the wound may convey the *streptococcus* or other germ. Our skin is a protective coating. Whenever that is rubbed or scratched off, or cut in any way, then bacteria can get access, just as fermentation germs can to sugary fluids and set going a beer or wine-making process. Most bacilli are hostile to the corpuscles of the blood. No sooner do they gain access to the blood-stream than they act as the ship-wrecked Irishman is said to have done as, scrambling ashore on a desert island, he shook the water out of his eyes and exclaimed, "If there's a government in this country, I'm agin it." To show how dangerous dust and dirt may be, two cases mentioned in Mrs. Percy Frankland's "Bacteria in Daily Life" may be quoted, which are most striking. Some cobweb was used to stop the bleeding from a cut. It so happened that this cobweb fluttering about had caught some lock-jaw germs and entangled them. Thus, the patient was inocculated, and died. To prove that it was the cobweb that caused the trouble some further inoculations of it were made into animals, and they, too, died of tetanus. A child ill of diphtheria had played with a wooden toy; six months after some germs of that dreaded disease were found on the toy.

We may say that Perth is extraordinarily favoured by Nature in regard to her situation. To begin with, she is on a natural sand filter-bed, so that when slops are thrown into backyards they stand a good chance of being purified.

I should here explain the distinction in effect between throwing slops on a sandy surface and storing them in a closed receptacle such as the misnamed "dry-well," or accumulating filth in a cesspit. It is the air that makes the difference. Just as in the sand filter-beds used for water purification there are beneficial germs which neutralise the bad ones, so in our backyards the surface freely exposed to the air becomes covered with micro-organisms which rapidly destroy, without injury to health, all putrescible matter. When gathered together in quantity, with very limited air supply, filth is attacked by anaërobic germs which cause the evolution of offensive gases. If these gain access to houses they produce a general lowering of the health, and thus predispose to diseases. Advantage has been taken of this behaviour on the part of different germs in the modern process of purification of sewage by bacterial agency. There is first a closed tank to which little or no air is admitted. The anaërobic germs which are always present in sewage immediately begin to multiply and break up the complex organic compounds. If the material were left long in this chamber it would be a dry-well over again, but matters are so arranged that at the end of 24 hours the contents are passed on to filter-beds of sand, coke-breeze, finely-broken granite, minute fragments of brick-bats, or fine gravel. These do not become dissolved and allow air to freely pass. Then the aërobic germs flourish, and these without injury, finish the process. I will show you a photograph of a septic tank. (Fig. IV.)

Then we have a second privilege in the amount of sunshine we receive. This disinfects the refuse and dust of our streets, and saves us from a much higher death-rate. Cholera germs and influenza bacilli are destroyed in a very short while by exposure to direct sunshine; and even the tougher ones thrive better in the dark, and in time perish in sunlight. This ought to teach us the importance of letting sunlight into our rooms. Sunlight also has a very beneficial effect on water stored for drinking purposes in big reservoirs.

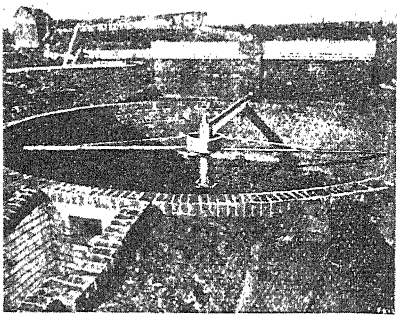


Fig. IV.—Candy-caink sprinkler to secure aeration of filter beds used with septic tanks.

The *prevention* of disease is more important than the cure of it. Every man has to be trained for life. He must not merely learn the elementary subjects of school education, but he must have practice in the business he adopts before he is efficient; and when he has had long experience he is of more value to the world. If such a man is cut off in his prime by consumption or typhoid, for instance, the whole of the money expended in teaching and training him has been lost. It is a low estimate to say that each man costs at least £100 before he becomes efficient at anything, apart from mere maintenance. Every life saved by superior knowledge of the laws of health represents, therefore, this minimum sum to the State. That is just the money value of the humblest unskilled worker. What has bacteriology to say on this question? Take consumption, for instance—the tendency to it is hereditary, but the strongest constitution may succumb, if exposed for a long time, or under unfavourable circumstances, to this deadly germ. Great improvements have been effected in the death rate from this cause, but in England over 40,000 a year still die of phthisis, and here in Perth we see enough of it to realise that we have still room for improvement. In the Perth Public Hospital there were, last year, 68 cases out of a total of 1,800 odd admissions. The most active source of infection is probably the expectoration of infected persons. (Fig. V.)

We may be proud to think that Australia is well in the van in regard to regulations against spitting in public places and conveyances. The class of people who indulge in this pernicious habit are hardly likely to attend lectures; but, as voters, I hope all present will support the authorities in strictly carrying out the regulations which are placarded in tram-cars and elsewhere. It is not enough for members of Parliament to make these rules—we must look to our magistrates to enforce them. The floors of bars in public houses should be scrubbed with phenyle every morning. The germs of this disease are incredibly hardy. Even when dried, and floating in dust, they can keep their virulence for a twelvemonth. They can live for months in water. Even the stumps of cigars smoked by consumptive patients contain tubercle bacilli, though tobacco smoke has been shown to be very injurious to many germs, such as cholera, typhoid, etc. Besides consumption of the lungs, the tubercle bacilli cause hip-joint disease in young children, which leaves them lame for life, and many other troubles too.

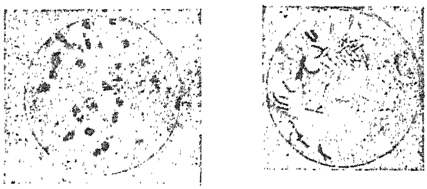


Fig. V.—Leprosy—Section of skin. Tubercle bacilli.

Nothing shows the importance of prevention of disease more than the experience of war time. It may surprise you to learn that in every war the deaths from disease far outnumber those from wounds or killed in action. In the Crimea four thousand six hundred were killed, while seventeen thousand five hundred died of disease. In the Spanish-American war four hundred and fifty-four were killed, while five thousand two hundred and seventy-seven died of disease. In the Transvaal the proportion of deaths from disease were much reduced, but still greatly exceeded the lists of killed and died of wounds.

The removal of refuse is a question that partly belongs to bacteriology. The germs that break up organic compounds all live near the surface. It is a mistake to bury such refuse deeply. A covering of an inch or two of mould is more effectual than placing it at a depth of three or four feet. Growing crops is the best means of destroying sewage. There is no fear of getting disease through vegetables grown on sewage farms, but germs may cling to the stems or under leaves, so there is a certain amount of danger in consuming raw vegetables such as lettuces or water-cress grown in heavily manured swamps. The fermenting refuse from dust-bins is frequently converted into harmless products by being burned in destructors. In several places the heat from the refuse has been utilised as power. In Shoreditch, London, electric light was generated in this way, and the income, with a low price charged per unit, was sufficient to pay all expenses and give a return equivalent to 8½ per cent. on the outlay. No nuisance was caused. The clinkers make good road ballast. Professor George Forbes stated at St. Louis, U.S.A., in 1893, "Taking the ordinary house refuse, consisting of ashes, coal, wood, paper, old boots, vegetables, bones and scraps, crockery, tin cans, iron pots, and bottles, and adding thereto occasionally dead cats and dogs, infected mattresses and condemned meat, I can throw the whole of these, without sorting, upon the furnaces, and without producing any offensive odour or dust, I can raise the temperature of the gases to 2000° F. The house-refuse of any town can supply enough steam to generate electric light at the rate of one 16 candle-power lamp per head of the population for two hours every night of the year."

Another point on which bacteriology has a word to say is the importance of personal hygiene—cleanliness, in fact. You know that the condition of the soil is quite as important in securing a good crop as the quality of the seed you sow. Now if the body is not kept in good health it affords a favourable soil for the bacterial seed. It is at moments of great fatigue, general slackness for want of food, debility after a long illness, or constitutional feebleness from bad surroundings, that the admission of injurious germs proves so serious.

Another point of personal hygiene on which bacteriology has a word to say is the care of the teeth. The grinding and crushing of the food is the first stage of digestion. Without it we fail to assimilate what we eat. Now, the mouth, being warm and moist, makes an admirable culture chamber; microbes, feeding on particles of food between the teeth, rapidly multiply, acid fermentation takes place, and caries, or decay of the teeth, follows. Cleansing of the teeth with antiseptic washes or pastes is of great importance, and even young children need careful cleansing of the mouth. The stopping of teeth in the early stage of caries is too much neglected here. Over two per cent. of the recruits wishing to enter the British army are annually rejected for bad teeth.

It does not pay a State to allow slums. Those who are well in health or well off in pocket have to pay for those who are too feeble to work, whether they like it or no. When houses are built back to back, or facing narrow passages which the sun never enters, or when people are crowded together, several in a room, the constitution quickly becomes undermined, and the first germ that comes along takes hold.

Overcrowding in factories is another point of public health on which bacteriology has a say. I will quote from a leader in the *West Australian*, which will show you we need such supervision here:—

> The report declares that, in no fewer than 90 per cent. of the factories, ventilation was insufficient. Many of the buildings had been hastily and roughly fitted up, while others are said to have been converted into factories, and used as such, "without any alterations whatever." Mention is made of

"unlined walls, roofs, and ceilings," of bakehouses where cleanlines was "sadly neglected," of "dirty unaproned boys handling and preparing foodstuffs"; of the floors of confectionery shops "inches deep in a combination of syrup, sawdust, and dirt." In the majority of cases, the supply of fresh water for drinking, and of wash-hand basins and towels, was declared to be totally inadequate. Twenty per cent. of the factories are said not to have provided their hands with the minimum working space of 400 cubic feet per head—the space fixed in Queensland, New South Wales, and Victoria.

The ventilation of school-rooms, where young children are crowded together—here, I am pleased to say, Western Australia is well to the fore—and of bedrooms is a most important thing. Every hour we need a thousand cubic feet of air. Unfortunately in Perth there is not sufficient attention paid to this. There are scores of young men sleeping three in a room, which has not cubic space for more than one. About a third of each day is spent in the bedroom, so that if you live to be a hundred you will have been bedridden for 33 years. It is when you are dead to the world in sleep that the angel of disease is most likely to visit you. The way to look at such things as fresh air, exercise, good food, and ventilation in the bedroom is this: Every day there enters into our circulation some micro-organism that is dangerous to our health. Our blood corpuscles have the power of attacking and destroying these. (Fig. VI.)

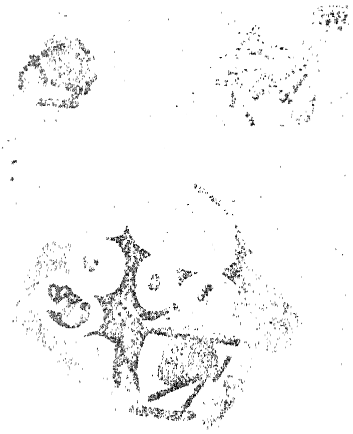


Fig. VI.—Phagocytosis (after Metschnikoff).
a. A macrophage with bacilli. *b*. *idem*. *c*. Macrophage with bacilli and leucocytes.

They are our men-o'-war, guarding our shores just as the British fleets guard the Empire. To keep ourselves in health is to have our navy in proper fighting trim, then we fear no foe in the shape of bacteria. These corpuscles pass out of the circulation into the tissues from time to time and back again. The effect of exercise and massage is to move them about and assist their re-entrance into the arteries and veins where their vigour is renewed, just as the war-ships come to dock to be refitted and to have their stores of coal and projectiles renewed.

It is only quite lately that we have learned that insects play an active part in disseminating disease. The first one that I will deal with is flies—so common a plague in this country. Many dangerous microbes, such as those of consumption and typhoid, can pass through the digestive tract of a fly uninjured. Where as in Perth we have a pan system for removal of sewage, these carriers of disease are particularly to be dreaded. As they live on garbage, their presence in numbers is a proof their food-garbage is plentiful. Thus they are a reproach as a sign of uncleanliness. Even when they do not feed on disease-infected substances their feet get clogged with impurities loaded with bacteria. They crawl over our food or drown themselves in our tea, and thus spread disease; bubonic plague may be passed on in this way. In the war-time both flies and disease abound, the one helps to bring the other. In the Crimea they swarmed in millions, attacking the food on its way to the mouth so that it was literally impossible to avoid swallowing some. The South African war told the same tale. Sir Wm. Church stated that on entering a hospital it was possible at once to identify the typhoid patients by the grim pall of the flies that had settled on them, But this war has also taught us the inestimable advantages to be gained by fighting the plague. Dr. Cooper, a captain in the Royal Army Medical Corps, was in charge of a field hospital at Harrismith. Enteric and dysentery had nearly always prevailed there before the war, so that there was abundant material to form the focus of an outbreak. The conditions of war time were sure to fan the embers. Pestilence is the twin brother of war. During the first fever season, 1900-1901, no precautions against flies were taken. The next time, in the fever period of 1901-1902, very elaborate precautions were devised and the result was most impressive. Some of the cases occurred amongst troops stationary at the town—others were brought in from time to time from neighbouring corps. It is plain that any local precautions could only influence the number and severity of cases caught in the local district affected by the altered regulations. During the first season there were 756 cases of enteric fever, of which 631 were of local origin, and 280 cases of dysentery, 219 of which arose from local infection. The deaths numbered 99 from fever, 81 of these being from the local cases; and 10 from dysentery, nine of these being also local in origin. The public water supply was carefully examined, both microscopically and bacteriologically, and found to be irreproachable. The troops were receiving none but tinned milk, so that no suspicion attached to that. On the other hand, there was a general condition of filth in the town quite indescribable in a non-professional paper. Neither Boers nor natives are given to cleanliness apparently. The quantity of abominable material lying about everywhere engendered enormous quantities of flies, which flew backwards and forwards between the filth and the food. "Indeed," says Captain Cooper, "their numbers were so great that one could only account for the fact that everyone was not infected by supposing that many had become immune through constantly imbibing small doses of the poison." The precautions adopted were :--(1.) The protection of filth from flies; (2.) The destruction of flies and prevention of their breeding; (3.) The protection of all kinds of food from flies. Now see what the result of these precautions was. In the following season there were altogether 1,015 cases of enteric fever and 457 of dysentery—that is, nearly half as many cases again of fever and more than half as many again of dysentery as in the previous year. But whereas 631 fever cases and 219 of dysentery were locally contracted in the first year, in the second only 62 of fever and 30 of dysentery were so produced. This is about as striking testimony as could well be adduced. The deaths from these diseases drive home the truth even more forcibly. In the first season the fever cases of local origin caused 81 out of the 99 deaths which occurred, showing of what a severe type the disease was; whilst in the second season not a single death occurred among the local cases, showing how much less virulent the infection was. The deaths from dysentery tell the same tale. Nine out of ten deaths were contracted locally the first year and not one the second, while the deaths among the imported cases were still numerous. Let us hope that when we get our long-talked-of system of water sewerage we shall be able to considerably reduce the plague of flies—no easy task, seeing that a single female fly may be the ancestress of 25,000,000 descendants in the course of a single season. Death to the flies must be our war cry.

Ants are useful scavengers, but they, too, can convey disease. When they feed on rats dead of the plague, for instance, they can pass on the dreaded scourge.

Fleas and certain other unmentionable horrors of dirty houses are equally objectionable as disease disseminators—in fact, any puncture of the skin made by anything animal or not can introduce virus.

As for mosquitoes, they have been shown to be the sole cause of whole districts being declared unfit for white men to live in. The west coast of Africa has earned the unenviable title of "The white man's grave." A grim joke has it that the west coast always needs three governors at a time—one just dead, one just entered on office, and the third one on his way out to replace the second. The marshy districts of the Campagna, near Rome, in Italy, are at times so unhealthy that to sleep a single night in them is death for a stranger. Havannah has for years had yellow fever, and at times it spreads thence to Louisiania, in the United States, sometimes devastating the banks of the Mississippi for an immense distance. All this waste of human life has been caused by the mosquito. From the coldest districts of the Yukon to the hottest parts of the West Indies, as ubiquitous as the British flag itself, is this pest. So far as we know at present, it is only one species, the *anopheles*, which conveys malaria fever. (Fig. VII.)

The investigations which have proved this are most interesting. Doctors slept in the deadliest parts of the Roman Campagna by adopting the simplest precautions. They retired before sunset to mosquito-proof huts. That was all. By examining a drop of blood, if a doctor finds the germs of ague, he can forcast a coming attack of fever as easily as our meteorological department can forecast the weather. By destroying mosquitoes and excluding them from houses, the West Coast of Africa has been made infinitely more healthy. All the marshes where these insects breed, and where their larvæ abound, are watered with a strong solution of permanganate of potash, or a thin film of kerosene oil is poured over the surface, which suffocates the creatures. In this way, since the American-Spanish war, the American army surgeons have been enabled to pass a summer in Havannah without a single case of yellow fever. These are notable achievements of modern science, are they not?

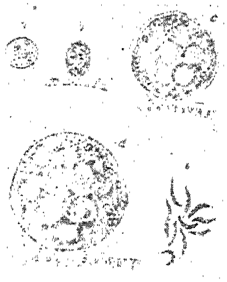


Fig. VII.- Germs of malaria in the mosquito.

Some grand results in the way of curing disease, as well as preventing it, must be credited to the study of bacteriology. The introduction of precautions against the entry of germs (*asepsis*), and of antidotes to any germs that may be accidentally present (antiseptics) has enabled modern surgeons to perform most daring operations with remarkable success. This revolution in surgical technique was effected by a Mr. Lister, who has been rewarded for his brilliant work by the bestowal of the first and only peerage that has ever fallen to the lot of the medical profession. The science which began by benefiting surgery is now conferring equal favours on the physicians. A serum has been prepared which has remarkable control over diphtheria, also ones against typhoid and plague. Antidotes to snake-bite have been made. This poison is not bacterial, but the investigations have been made by bacteriologists.

Here again there is need for original investigation work by a scientist on the spot. Each snake's venom requires a different antidote, and the effectual way of providing a remedy is for the poison of each snake or species of snake to be taken, and experiments conducted with a view to procuring a serum for inoculation. You are all well aware of the immense benefit mankind has derived from Pasteur's discovery of a cure for rabies—the terrible disease inoculated into man by a bite from a mad dog. There are hopes that consumption may be cured by this method of treatment, and it is quite possible that all the infectious diseases—blood poisoning, lockjaw, scarlatina, and so on—may be conquered in the same way.

Thus bacteriology teaches us the necessity of studying public health. Lord Beaconsfield, the far-seeing, made an observation long ago on the transcending importance of sanitary questions. "With the more accurate knowledge of modern times, we can realise the imperative duty that lies on members of Parliament to study such subjects as water supply, drainage, purification of sewage, the prevention of overcrowding, the need of parks and squares, of space between the several houses, of regulating the cubic space in lodging-house bedrooms, hospitals, and public schools. It behoves the Cabinet Ministers to promote knowledge of sciences such as this to enable their people to get the advantage of every new discovery as soon as possible."

These questions of public health are so important that I would urge the abandonment of the present system in Western Australia of giving a small fee to a general practitioner to add health duties to general practice, in favour of obtaining high-class experts as medical officers of health to work exclusively at their public duties. In England the method used to be the same as that in vogue here now. Each little municipality or other authority had its separate health doctor. This plan was found to work badly, so it has been abandoned. Now combined districts are formed by the union of urban and rural health authorities, who each contribute, *pro rata*, to the salary of the medical officer of health, and the central government contributes a further sum. In this way they are able, without spending more than they did formerly, to pay salaries of £800 to £1,200 a year and get highly-trained experts. We might have a metropolitan district extending from Chidlow's Well to Fremantle, an Avon Valley district from Chidlow's Well to Southern Cross, including York, Northam, and Newcastle. Another might extend from Southern Cross to Kanowna. The Great Southern line to Albany and the South-Western line to Bunbury might also be made districts in this way, and possibly others.

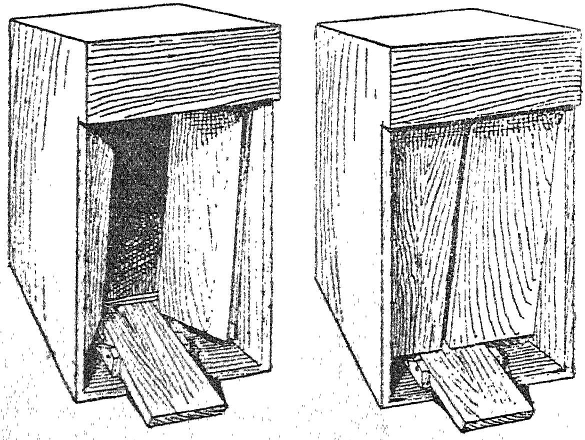
This concludes my task. I have endeavoured to show that the science of bacteriology needs the profoundest study, and that it pays a community to spend part of their income on pure science. Far from being money thrown away, there is no knowing what benefits may ensue. The money value of health is simply incalculable, and you can see for yourselves what splendid advances have been made in the general health by the discovery of learned men poring over microscopes or absorbed in the management of test tubes and unsavoury messes. I have also shown you what a number of trades and occupations have gained—what piles of money have been made by attention to the teachings of science.

I trust I have not wearied you with detail. I thank you for the patient attention you have given me.

POULTRY NOTES.

By Frank H. Robertson.

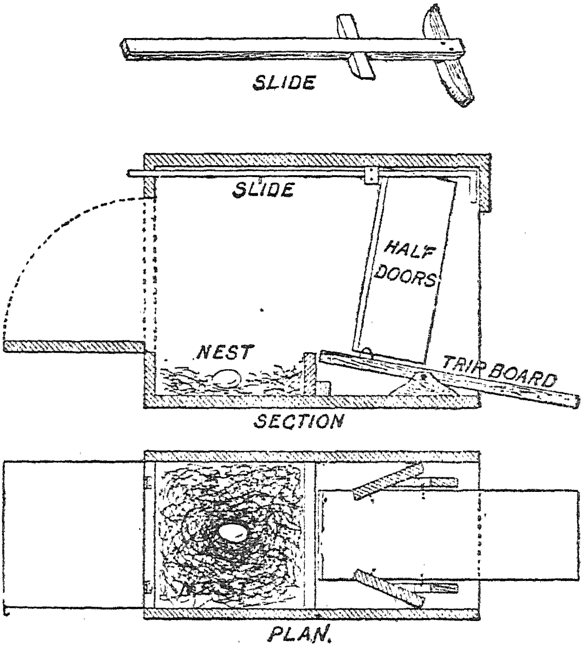
One of the features with the present day up-to-date poultryman is the great attention that is being paid to an increased egg production, by grading up the stock to find out which are the best laying hens of the flock and discarding all from the breeding pens which do not come up to what is considered a satisfactory standard of excellence. It is a well-known fact that, in a yard of poultry of any breed one likes to mention, although to all outward appearances one hen looks as good a layer as the other, such is not actually the case; far from it; some are much better layers than others; the differences in the egg yield have been proved to be quite surprising. It therefore behoves poultry-keepers to in all cases refrain from breeding from hens known to be poor layers; the difficulty, of course, is to be able to spot the good from the bad. In a small yard where only a few fowls are kept the drones are generally pretty well known, but where several different lots of pens have to be attended to it becomes a matter of impossibility to know which are the best layers in each lot. So, to overcome this difficulty, the resourceful Yankee has introduced a system of "Recording Nests," which are much in vogue in the United States, and also somewhat in evidence in some parts of Australia, New South Wales in particular, that being the State which appears to be the most progressive in matters appertaining to advanced ideas in poultry culture. There are several ways of making trap-nests, but the accompanying illustrations will explain one of simple con-



Trap Nest (from Lewis Wright's new book on Poultry).

struction. The hen about to lay enters the open nest box, and on stepping on to the pivoted board causes the two doors to swing back and enclose the hen; the doors should not fit close against each other, so as to prevent the hen's tail being caught. The hen is thus a prisoner until released, by means of a door at the back of the box. Several of these nests are placed in each run, and as every hen has a numbered leg band, a record of each hen's laying is thus recorded, and those that prove themselves the most prolific are the ones which are bred from.

To the poultry-keeper who finds it a bore to attend to the ordinary wants of his fowls, the trouble and expense of trap-nests would be quite out of the question; but it is quite another matter to the person who is anxious to improve the egg-laying qualities of his flock, and thinks the work of running these nests more than compensates for the expense of feeding hens, the egg production of which is not sufficient to pay for their feed bill. By continuous culling in the manner described, the wonderful egg-laying strains are thus produced, and flocks showing an average yield of 200 eggs per hen per annum are not unfrequently to be met with, which must result in a very handsome profit; but, on the other hand, when such excessive production has been attained one cannot help thinking that the produce of such fowls must be wanting in strength and stamina, and therefore not likely to be of sufficient strength to



Plan of Trap Nest (from Lewis Wright's new book on Poultry).

perpetuate the great productiveness of their parents. To my mind it would be of more advantage to strike a middle course and be satisfied with a moderate egg production, combined with good vitality. An average yield of 150 can be considered very good, and one which would give a splendid profit, or even 120 would pay well; it is the small averages such as 50 and 60 that are far too frequent on West Australian farms, and give many persons the idea that poultry do not pay. Keep the right kinds and look after them properly, and the satisfactory returns must follow.

One great drawback to successful poultry raising on many farms is the want of shade and shelter, as supplied by trees, scrub, or hedges. The farmer's home is in too many instances a plain building, devoid of anything in the shape of ornament, standing in grim and lonely solitude, its nearest neighbour being the stable, some 50 yards away, and never a bit of shelter nearer than the single old white gum on yonder hill a mile away. There is nothing to act as a protection from the cold winds and rain of winter, or summer's sweltering heat. The ploughed land, bearing crop, runs to within a few yards of the front door, also, on both sides, and again close up to the back of the stables. The growing of crop, and crop alone, is the one and only idea of the owners of properties of this sort. On such a place poultry cannot thrive and be a source of profit. One of the first essentials is to keep the fowls under natural conditions, with comfortable surroundings, and the best mode of obtaining such is by plenty of tree shelter. If everything has been cleared off the ground, the best plan is to plant a good number of quick-growing shrubs, which all the year round bear luxuriant foliage; among such is the castor oil tree, tree lucerne, pepper trees, wattles. Good breakwinds are quickly grown by means of creepers such as passion fruit, dolichos, blue convolulus, black kennedya. New settlers, it is to be hoped, will avoid the too-frequent error of clearing off every scrap of growth, and leave shelter clumps for the poultry, not too near the house, but within convenient distance. Should the timber be mostly large and tall, the smallest and most umbrageous could remain, but cut down the big sticks without grubbing the stumps, and in a short space of time a luxuriant undergrowth will arise and thus provide just what is wanted, or if the trees are ringbarked a suitable undergrowth is obtained. Of course old-established farm yards are generally supplied with a number of sheds and outbuildings of various kinds, which afford the required protection. But the selector is the man whose attention wants calling to this point, and of course he is the man who is in most want of a quick return, and the raising of poultry will be found one of the most suitable branches for this purpose.

Breeder's Table for January.

Day of Month.	In the blank Lines insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		MARE, 48 weeks.	COW, 40 weeks.	EWE and GOAT, 21 weeks.	SOW, 16 weeks.	BITCH, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.
1	....	Dec. 2	Oct. 8	May 29	April 22	Mar. 4	Jan. 31	Jan. 29	Jan. 25	Jan. 22	Jan. 19	Jan. 14
2	....	3	9	30	23	5	Feb. 1	30	26	23	20	15
3	....	4	10	31	24	6	2	31	27	24	21	16
4	....	5	11	June 1	25	7	3	Feb. 1	28	25	22	17
5	....	6	12	2	26	8	4	2	29	26	23	18
6	....	7	13	3	27	9	5	3	30	27	24	19
7	....	8	14	4	28	10	6	4	31	28	25	20
8	....	9	15	5	29	11	7	5	Feb. 1	29	26	21
9	....	10	16	6	30	12	8	6	2	30	27	22
10	....	11	17	7	May 1	13	9	7	3	31	28	23
11	....	12	18	8	2	14	10	8	4	Feb. 1	29	24
12	....	13	19	9	3	15	11	9	5	2	30	25
13	....	14	20	10	4	16	12	10	6	3	31	26
14	....	15	21	11	5	17	13	11	7	4	Feb. 1	27
15	....	16	22	12	6	18	14	12	8	5	2	28
16	....	17	23	13	7	19	15	13	9	6	3	29
17	....	18	24	14	8	20	16	14	10	7	4	30
18	....	19	25	15	9	21	17	15	11	8	5	31
19	....	20	26	16	10	22	18	16	12	9	6	Feb. 1
20	....	21	27	17	11	23	19	17	13	10	7	2
21	....	22	28	18	12	24	20	18	14	11	8	3
22	....	23	29	19	13	25	21	19	15	12	9	4
23	....	24	30	20	14	26	22	20	16	13	10	5
24	....	25	31	21	15	27	23	21	17	14	11	6
25	....	26	Nov. 1	22	16	28	24	22	18	15	12	7
26	....	27	2	23	17	29	25	23	19	16	13	8
27	....	28	3	24	18	30	26	24	20	17	14	9
28	....	29	4	25	19	31	27	25	21	18	15	10
29	....	30	5	26	20	April 1	28	26	22	19	16	11
30	....	31	6	27	21	2	Mar. 1	27	23	20	17	12
31	....	Jan. 1	7	28	22	3	2	28	24	21	18	13

Breeder's Table for February.

Day of Month.	In the blank Lines insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.
1		Jan. 2	Nov. 8	June 29	May 23	April 4	Mar. 3	Mar. 1	Feb. 25	Feb. 22	Feb. 19	Feb. 14
2		3	9	30	24	5	4	2	26	23	20	15
3		4	10	July 1	25	6	5	3	27	24	21	16
4		5	11	2	26	7	6	4	28	25	22	17
5		6	12	3	27	8	7	5	Mar. 1	26	23	18
6		7	13	4	28	9	8	6	2	27	24	19
7		8	14	5	29	10	9	7	3	28	25	20
8		9	15	6	30	11	10	8	4	Mar. 1	26	21
9		10	16	7	31	12	11	9	5	2	27	22
10		11	17	8	June 1	13	12	10	6	3	28	23
11		12	18	9	2	14	13	11	7	4	Mar. 1	24
12		13	19	10	3	15	14	12	8	5	2	25
13		14	20	11	4	16	15	13	9	6	3	26
14		15	21	12	5	17	16	14	10	7	4	27
15		16	22	13	6	18	17	15	11	8	5	28
16		17	23	14	7	19	18	16	12	9	6	Mar. 1
17		18	24	15	8	20	19	17	13	10	7	2
18		19	25	16	9	21	20	18	14	11	8	3
19		20	26	17	10	22	21	19	15	12	9	4
20		21	27	18	11	23	22	20	16	13	10	5
21		22	28	19	12	24	23	21	17	14	11	6
22		23	29	20	13	25	24	22	18	15	12	7
23		24	30	21	14	26	25	23	19	16	13	8
24		25	Dec. 1	22	15	27	26	24	20	17	14	9
25		26	2	23	16	28	27	25	21	18	15	10
26		27	3	24	17	29	28	26	22	19	16	11
27		28	4	25	18	30	29	27	23	20	17	12
28		29	5	26	19	May 1	30	28	24	21	18	13

Breeder's Table for March.

Day of Month.	In the blank Lines insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.
1		Jan. 30	Dec. 6	July. 27	June 20	May 2	Mar. 31	Mar. 29	Mar. 25	Mar. 22	Mar. 19	Mar. 14
2		31	7	28	21	3	April 1	30	26	23	20	15
3		Feb. 1	8	29	22	4	2	31	27	24	21	16
4		2	9	30	23	5	3	April 1	28	25	22	17
5		3	10	31	24	6	4	2	29	26	23	18
6		4	11	Aug. 1	25	7	5	3	30	27	24	19
7		5	12	2	26	8	6	4	31	28	25	20
8		6	13	3	27	9	7	5	April	29	26	21
9		7	14	4	28	10	8	6	2	30	27	22
10		8	15	5	29	11	9	7	3	31	28	23
11		9	16	6	30	12	10	8	4	April 1	29	24
12		10	17	7	July 1	13	11	9	5	2	30	25
13		11	18	8	2	14	12	10	6	3	31	26
14		12	19	9	3	15	13	11	7	4	April 1	27
15		13	20	10	4	16	14	12	8	5	2	28
16		14	21	11	5	17	15	13	9	6	3	29
17		15	22	12	6	18	16	14	10	7	4	30
18		16	23	13	7	19	17	15	11	8	5	31
19		17	24	14	8	20	18	16	12	9	6	April 1
20		18	25	15	9	21	19	17	13	10	7	2
21		19	26	16	10	22	20	18	14	11	8	3
22		20	27	17	11	23	21	19	15	12	9	4
23		21	28	18	12	24	22	20	16	13	10	5
24		22	29	19	13	25	23	21	17	14	11	6
25		23	30	20	14	26	24	22	18	15	12	7
26		24	31	21	15	27	25	23	19	16	13	8
27		25	Jan. 1	22	16	28	26	24	20	17	14	9
28		26	2	23	17	29	27	25	21	18	15	10
29		27	3	24	18	30	28	26	22	19	16	11
30		28	4	25	19	31	29	27	23	20	17	12
31		Mar. 1	5	26	20	June 1	30	28	24	21	18	13

Breeder's Table for April.

Day of Month.	In the blank Lines insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	21 weeks	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.
1		Mar. 2	Jan. 6	Aug. 27	July 21	June 2	May 1	April 29	April 25	April 22	April 19	April 14
2		3	7	28	22	3	2	30	26	23	20	15
3		4	8		23	4	3	May 1	27	24	21	16
4		5	9	30	24	5	4	2	28	25	22	17
5		6	10	31	25	6	5		29	26	23	18
6		7	11	Sept. 1	26	7	6	4	30	27	24	19
7		8	12	2	27	8	7	5	May 1	28	25	20
8		9	13	3	28	9	8	6	2	29	26	21
9		10	14	4	29	10	9	7	3	30	27	22
10		11	15	5	30	11	10	8	4	May 1	28	
11		12	16	6	31	12	11	9	5	2	29	24
12		13	17	7	Aug. 1	13	12	10	6	3	30	25
13		14	18	8	2	14	13	11	7	4	May 1	26
14		15	19	9	3	15	14	12	8	5	2	27
15		16	20	10	4	16	15	13	9	6	3	28
16		17	21	11	5	17	16	14	10	7	4	29
17		18	22	12	6	18	17	15	11	8	5	30
18		19	23	13	7	19	18	16	12	9	6	May 1
19		20	24	14	8	20	19	17	13	10	7	2
20		21	25	15	9	21	20	18	14	11	8	3
21		22	26	16	10	22	21	19	15	12	9	4
22		23	27	17	11	23	22	20	16	13	10	5
23		24	28	18	12	24	23	21	17	14	11	6
24		25	29	19	13	25	24	22	18	15	12	7
25		26	30	20	14	26	25	23	19	16	13	8
26		27	31	21	15	27	26	24	20	17	14	9
27		28	Feb. 1	22	16	28	27	25	21	18	15	10
28		29	2	23	17	29	28	26		19	16	11
29		30	3	24	18	30	29	27	23	20	17	12
30		31	4	25	19	July 1	30	28	24	21	18	13

Breeder's Table for May.

Day of Month.	In the blank Lines insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.
1		April 1	Feb. 5	Sept. 26	Aug. 20	July 2	May 31	May 29	May 25	May 22	May 19	May 14
2		2	6	27	21	3	June 1	30	26	23	20	15
3		3	7	28	22	4	2	31	27	24	21	16
4		4	8	29	23	5	3	June 1	28	25	22	17
5		5	9	30	24		4	2	29	26	23	18
6		6	10	Oct. 1	25	7	5	3	30	27	24	19
7		7	11	2	26	8	6	4	31	28	25	20
8		8	12	3	27	9	7	5	June 1	29	26	21
9		9	13	4	28	10	8	6	2	30	27	22
10		10	14	5	29	11	9	7	3	31	28	23
11		11	15	6	30	12	10	8	4	June 1	29	24
12		12	16	7	31	13	11	9	5	2	30	25
13		13	17	8	Sept. 1	14	12	10	6	3	31	26
14		14	18	9	2	15	13	11	7	4	June	27
15		15	19	10	3	16	14	12	8	5	2	28
16		16	20	11	4	17	15	13	9	6	3	29
17		17	21	12	5	18	16	14	10	7	4	30
18		18	22	13	6	19	17	15	11	8	5	31
19		19	23	14	7	20	18	16	12	9	6	June 1
20		20	24	15	8	21	19	17	13	10	7	2
21		21	25	16	9	22	20	18	14	11	8	3
22		22	26	17	10	23	21	19	15	12	9	4
23		23	27	18	11	24	22	20	16	13	10	5
24		24	28	19	12	25	23	21	17	14	11	6
25		25	Mar. 1	20	13	26	24	22	18	15	12	7
26		26	2	21	14	27	25	23	19	16	13	8
27		27	3	22	15	28	26	24	20	7	14	9
28		28	4	23	16	29	27	25	21	18	15	10
29		29	5	24	17	30	28	26	22	19	16	11
30		30	6	25	18	31	29	27	23	20	17	12
31		May 1	7	26	19	Aug. 1	30	28	24	21	18	13

Breeder's Table for June.

Day of Month.	In the blank Lines insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last egg.	Canary, 13 days from steady sitting.
1		May 2	Mar. 8	Oct. 27	Sept. 20	Aug. 2	July 1	June 29	June 25	June 22	June 19	June 14
2		3	9	28	21	3	2	30	26	23	20	15
3		4	10	29	22	4	3	July 1	27	24	21	16
4		5	11	30	23	5	4	2	28	25	22	17
5		6	12	31	24	6	5	3	29	26	23	18
6		7	13	Nov. 1	25	7	6	4	30	27	24	19
7		8	14	2	26	8	7	5	July 1	28	25	20
8		9	15	3	27	9	8	6	2	29	26	21
9		10	16	4	28	10	9	7	3	30	27	22
10		11	17	5	29	11	10	8	4	July 1	28	23
11		12	18	6	30	12	11	9	5	2	29	24
12		13	19	7	Oct. 1	13	12	10	6	3	30	25
13		14	20	8	2	14	13	11	7	4	July 1	26
14		15	21	9	3	15	14	12	8	5	2	27
15		16	22	10	4	16	15	13	9	6	3	28
16		17	23	11	5	17	16	14	10	7	4	29
17		18	24	12	6	18	17	15	11	8	5	30
18		19	25	13	7	19	18	16	12	9	6	July 1
19		20	26	14	8	20	19	17	13	10	7	2
20		21	27	15	9	21	20	18	14	11	8	3
21		22	28	16	10	22	21	19	15	12	9	4
22		23	29	17	11	23	22	20	16	13	10	5
23		24	30	18	12	24	23	21	17	14	11	6
24		25	31	19	13	25	24	22	18	15	12	7
25		26	April 1	20	14	26	25	23	19	16	13	8
26		27	2	21	15	27	26	24	20	17	14	9
27		28	3	22	16	28	27	25	21	18	15	10
28		29	4	23	17	29	28	26	22	19	16	11
29		30	5	24	18	30	29	27	23	20	17	12
30		31	6	25	19	31	30	28	24	21	18	13

Breeders' Table for July.

Day of Month.	In the blank Lines Insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present mouth is due to give birth or hatch.										
		MARE, 48 weeks.	COW, 40 weeks.	EWE and GOAT, 21 weeks.	SOW, 16 weeks.	BITCH, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last Egg.	Canary, 13 days from steady sitting.
1		June 1	April 7	Nov. 26	Oct. 20	Sept. 1	July 31	July 29	July 25	July 22	July 19	July 14
2		2	8	27	21	2	Aug. 1	30	26	23	20	15
3		3	9	28	22	3	2	31	27	24	21	16
4		4	10	29	23	4	3	Aug. 1	28	25	22	17
5		5	11	30	24	5	4	2	29	26	23	18
6		6	12	Dec. 1	25	6	5	3	30	27	24	19
7		7	13	2	26	7	6	4	31	28	25	20
8		8	14	3	27	8	7	5	Aug. 1	29	26	21
9		9	15	4	28	9	8	6	2	30	27	22
10		10	16	5	29	10	9	7	3	31	28	23
11		11	17	6	30	11	10	8	4	Aug. 1	29	24
12		12	18	7	31	12	11	9	5	2	30	25
13		13	19	8	Nov. 1	13	12	10	6	3	31	26
14		14	20	9	2	14	13	11	7	4	Aug. 1	27
15		15	21	10	3	15	14	12	8	5	2	28
16		16	22	11	4	16	15	13	9	6	3	29
17		17	23	12	5	17	16	14	10	7	4	30
18		18	24	13	6	18	17	15	11	8	5	31
19		19	25	14	7	19	18	16	12	9	6	Aug.
20		20	26	15	8	20	19	17	13	10	7	2
21		21	27	16	9	21	20	18	14	11	8	3
22		22	28	17	10	22	21	19	15	12	9	4
23		23	29	18	11	23	22	20	16	13	10	5
24		24	30	19	12	24	23	21	17	14	11	6
25		25	May 1	20	13	25	24	22	18	15	12	7
26		26	2	21	14	26	25	23	19	16	13	8
27		27	3	22	15	27	26	24	20	7	14	9
28		28	4	23	16	28	27	25	21	18	15	10
29		29	5	24	17	29	28	26	22	19	16	11
30		30	6	25	18	30	29	27	23	20	17	12
31		July 1	7	26	19	Oct. 1	30	28	24	21	18	13

Breeders' Table for August.

Day of Month.	In the blank Lines Insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last Egg.	Canary, 13 days from steady sitting.
1		July 2	May 8	Dec. 27	Nov. 20	Oct. 2	Aug. 31	Aug. 29	Aug. 25	Aug. 22	Aug. 19	Aug. 14
2		3	9	28	21	3	Sept. 1	30	26	23	20	15
3		4	10	29	22	4	2	31	27	24	21	16
4		5	11	30	23	5	3	Sept. 1	28	25	22	17
5		6	12	31	24	6	4	2	29	26	23	18
6		7	13	Jan. 1	25	7	5	3	30	27	24	19
7		8	14		26	8	6	4	31	28	25	20
8		9	15	3	27	9	7	5	Sept. 1	29	26	21
9		10	16	4	28	10	8	6	2	30	27	22
10		11	17	5	29	11	9	7	3	31	28	23
11		12	18	6	30	12	10	8	4	Sept. 1	29	24
12		13	19	7	Dec. 1	13	11	9	5	2	30	25
13		14	20	8	2	14	12	10	6	3	31	26
14		15	21	9	3	15	13	11	7	4	Sept. 1	27
15		16	22	10	4	16	14	12	8	5	2	28
16		17	23	11	5	17	15	13	9	6	3	29
17		18	24	12	6	18	16	14	10	7	4	30
18		19	25	13	7	19	17	15	11	8	5	31
19		20	26	14	8	20	18	16	12	9	6	Sept. 1
20		21	27	15	9	21	19	17	13	10	7	2
21		22	28	16	10	22	20	18	14	11	8	3
22		23	29	17	11	23	21	19	15	12	9	4
23		24	30	18	12	24	22	20	16	13	10	5
24		25	31	19	13	25	23	21	17	14	11	
25		26	June 1	20	14	26	24	22	18	15	12	7
26		27	2	21	15	27	25	23	19	16	13	8
27		28	3	22	16	28	26	24	20	17	14	9
28		29	4	23	17	29	27	25	21	18	15	10
29		30	5	24	18	30	28	26	22	19	16	11
30		31	6	25	19	31	29	27	23	20	17	12
31		Aug. 1	7	26	20	Nov. 1	30	28	24	21	18	13

Breeders' Table for September.

Day of Month.	In the blank Lines Insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days	Turkey, Duck, Peafowl. 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last Egg.	Canary, 13 days from steady sitting.
1		Aug. 2	June 8	Jan. 27	Dec. 21	Nov. 2	Oct. 1	Sept. 29	Sept. 25	Sept. 22	Sept. 19	Sept. 14
2		3	9	28	22	3	2	30	26	23	20	15
3		4	10	29	23	4	3	Oct. 1	27	24	21	16
4		5	11	30	24	5	4	2	28	25	22	17
5		6	12	31	25	6	5	3	29	26	23	18
6		7	13	Feb. 1	26	7	6	4	30	27	24	19
7		8	14	2	27	8	7	5	Oct. 1	28	25	20
8		9	15	3	28	9	8	6	2	29	26	21
9		10	16	4	29	10	9	7	3	30	27	22
10		11	17	5	30	11	10	8	4	Oct. 1	28	23
11		12	18	6	31	12	11	9	5	2	29	24
12		13	19	7	Jan. 1	13	12	10	6	3	30	25
13		14	20	8	2	14	13	11	7	4	Oct. 1	26
14		15	21	9	3	15	14	12	8	5	2	27
15		16	22	10	4	16	15	13	9	6	3	28
16		17	23	11	5	17	16	14	10	7	4	29
17		18	24	12	6	18	17	15	11	8	5	30
18		19	25	13	7	19	18	16	12	9	6	Oct. 1
19		20	26	14	8	20	19	17	13	10	7	2
20		21	27	15	9	21	20	18	14	11	8	3
21		22	28	16	10	22	21	19	15	12	9	4
22		23	29	17	11	23	22	20	16	13	10	5
23		24	30	18	12	24	23	21	17	14	11	6
24		25	July 1	19	13	25	24	22	18	15	12	7
25		26	2	20	14	26	25	23	19	16	13	8
26		27	3	21	15	27	26	24	20	17	14	9
27		28	4	22	16	28	27	25	21	18	15	10
28		29	5	23	17	29	28	26	22	19	16	11
29		30	6	24	18	30	29	27	23	20	17	12
30		31	7	25	19	Dec. 1	30	28	24	21	18	13

Breeders' Table for October.

Day of Month.	In the blank Lines Insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last Egg.	Canary, 13 days from steady sitting.
1		Sept 1	July 8	Feb. 26	Jan. 20	Dec. 2	Oct. 31	Oct. 29	Oct. 25	Oct. 22	Oct. 19	Oct. 14
2		2	9	27	21	3	Nov. 1	30	26	23	20	15
3		3	10	28	22	4	2	31	27	24	21	16
4		4	11	Mar. 1	23	5	3	Nov. 1	28	25	22	17
5			12	2	24	6	4	2	29	26	23	18
6		6	13	3	25	7	5	3	30	27	24	19
7		7	14	4	26	8	6	4	31	28	25	20
8		8	15	5	27	9	7	5	Nov. 1	29	26	21
9		9	16	6	28	10	8	6	2	30	27	22
10		10	17	7	29	11	9	7	3	31	28	23
11		11	18	8	30	12	10	8	4	Nov. 1	29	24
12		12	19	9	31	13	11	9	5	2	30	25
13		13	20	10	Feb. 1	14	12	10	6	3	31	26
14		14	21	11	2	15	13	11	7	4	Nov. 1	27
15		15	22	12	3	16	14	12	8	5	2	28
16		16	23	13	4	17	15	13	9	6	3	29
17		17	24	14	5	18	16	14	10	7	4	30
18		18	25	15	6	19	17	15	11	8	5	31
19		19	26	16	7	20	18	16	12	9	6	Nov. 1
20		20	27	17	8	21	19	17	13	10	7	2
21		21	28	18	9	22	20	18	14	11	8	3
22		22	29	19	10	23	21	19	15	12	9	4
23		23	30	20	11	24	22	20	16	13	10	5
24		24	31	21	12	25	23	21	17	14	11	6
25		25	Aug. 1	22	13	26	24	22	18	15	12	7
26		26	2	23	14	27	25	23	19	16	13	8
27		27	3	24	15	28	26	24	20	17	14	9
28		28	4	25	16	29	27	25	21	18	15	10
29		29	5	26	17	30	28	26	22	19	16	11
30		30	6	27	18	31	29	27	23	20	17	12
31		Oct. 1	7	28	19	Jan. 1	30	28	24	21	18	13

Breeders' Table for November.

Day of Month.	In the blank Lines Insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge. 24 days	Fowl, 21 days.	Pigeon, 18 days from last Egg.	Canary, 13 days from steady sitting.
1		Oct. 2	Aug. 8	Mar. 29	Feb. 20	Jan. 2	Dec. 1	Nov. 29	Nov. 25	Nov. 22	Nov. 19	Nov. 14
2		3	9	30	21	3	2	30	26	23	20	15
3		4	10	31	22	4		Dec 1	27	24	21	16
4		5	11	April 1	23	5	4	2	28	25	22	17
5		6	12	2	24	6	5	3	29	26	23	18
6		7	13	3	25	7	6	4	30	27	24	19
7		8	14	4	26	8	7	5	Dec. 1	28	25	20
8		9	15	5	27	9	8	6	2	29	26	21
9		10	16	6	28	10	9	7	3	30	27	22
10		11	17	7	Mar. 1	11	10	8	4	Dec. 1	28	23
11		12	18	8	2	12	11	9	5	2	29	24
12		13	19	9	3	13	12	10	6	3	30	25
13		14	20	10	4	14	13	11	7	4	Dec. 1	26
14		15	21	11	5	15	14	12	8	5	2	27
15		16	22	12	6	16	15	13	9	6	3	28
16		17	23	13	7	17	16	14	10	7	4	29
17		18	24	14	8	18	17	15	11	8	5	30
18		19	25	1	9	19	18	16	12	9	6	Dec. 1
19		20	26	16	10	20	19	17	13	10	7	2
20		21	27	17	11	21	20	18	14	11	8	3
21		22	28	18	12	22	21	19	15	12	9	4
22		23	29	19	13	23	22	20	16	13	10	5
23		24	30	20	14	24	23	21	17	14	11	6
24		25	31	21	15	25	24	22	18	15	12	7
25		26	Sept. 1	22	16	26	25	23	19	16	13	8
26		27	2	23	17	27	26	24	20	17	14	9
27		28	3	24	18	28	27	25	21	18	15	10
28		29	4	25	19	29	28	26	22	19	16	11
29		30	5	26	20	30	29	27	23	20	17	12
30		31	6	27	21	31	30	28	24	21	18	13

Breeders' Table for December.

Day of Month.	In the blank Lines Insert Name of Animal, Hen, etc.	Date on which an animal served or an egg set on any day of present month is due to give birth or hatch.										
		Mare, 48 weeks.	Cow, 40 weeks.	Ewe and Goat, 21 weeks.	Sow, 16 weeks.	Bitch, 9 weeks.	Goose and Rabbit, 30 days.	Turkey, Duck, Peafowl, 28 days.	Pheasant, Partridge, 24 days.	Fowl, 21 days.	Pigeon, 18 days from last Egg.	Canary, 13 days from steady sitting.
1		Nov. 1	Sept. 7	April 28	Mar. 22	Feb. 1	Dec. 31	Dec. 29	Dec. 25	Dec. 22	Dec. 19	Dec. 14
2		2	8	29	23	2	Jan. 1	30	26	23	20	15
3		3	9	30	24	3	2	31	27	24	21	16
4		4	10	May 1	25	4	3	Jan. 1	28	25	22	17
5		5	11	2	26	5	4	2	29	26	23	18
6		6	12	3	27	6	5	3	30	27	24	19
7		7	13	4	28	7	6	4	31	28	25	20
8		8	14	5	29	8	7	5	Jan. 1	29	26	21
9		9	15	6	30	9	8	6	2	30	27	22
10		10	16	7	31	10	9	7	3	31	28	23
11		11	17	8	April 1	11	10	8	4	Jan. 1	29	24
12		12	18	9	2	12	11	9	5	2	30	25
13		13	19	10	3	13	12	10	6	3	31	26
14		14	20	11	4	14	13	11	7	4	Jan. 1	27
15		15	21	12	5	15	14	12	8	5	2	28
16		16	22	13	6	16	15	13	9	6	3	29
17		17	23	14	7	17	16	14	10	7	4	30
18		18	24	15	8	18	17	15	11	8	5	31
19		19	25	16	9	19	18	16	12	9	6	Jan. 1
20		20	26	17	10	20	19	17	13	10	7	2
21		21	27	18	11	21	20	18	14	11	8	3
22		22	28	19	12	22	21	19	15	12	9	4
23		23	29	20	13	23	22	20	16	13	10	5
24		24	30	21	14	24	23	21	17	14	11	6
25		25	Oct. 1	22	15	25	24	22	18	15	12	7
26		26	2	23	16	26	25	23	19	16	13	8
27		27	3	24	17	27	26	24	20	17	14	9
28		28	4	25	18	28	27	25	21	18	15	10
29		29	5	26	19	Mar. 1	28	26	22	19	16	11
30		30	6	27	20	2	29	27	23	20	17	12
31		Dec. 1	7	28	21	3	30	28	24	21	18	13

THE RABBIT PEST IN NEW SOUTH WALES.

By C. Fetherstonhaugh.

I need hardly remind some of your readers that some twenty years ago I was rather importunate "in season and out of season" in urging upon my fellow-pastoralists the paramount importance of endeavouring to prevent the advance of the rabbit pest into the Central Division. I then advocated the use of netting chiefly as the best means to be adopted. However, nothing that could be said or done at that time seemed to avail. The bulk of landowners appeared to be quite satisfied that the pest would not reach their particular holding, or, if it did, that the rabbit would not make any headway. As to the pest making its way into the Eastern Division, that was out of the question.

What is the position to-day?

In 1876 I saw, I believe, the first wild rabbit killed on the New South Wales side of the Murray, when one of our Canally boundary riders brought in a rabbit he had killed on the Balranald town common.

To-day the whole of New South Wales is infested, and I am informed that rabbits have been killed within 400 miles of the waters of the Gulf of Carpentaria.

I need not expatiate on the devastation caused by the pest in the Western Division and on the immense sums of money expended for the most part in vain in endeavouring to cope with the pest in both the Western and Central Divisions.

It is, therefore, with great satisfaction that I now draw attention to the very satisfactory results achieved in Southern Riverina during the last twelve years in dealing with the pest.

As I intend to put only facts observed actually by myself before your readers, I will confine myself to that portion of Southern Riverina which in the course of my duties as Government assessor of land values I have personally visited, a piece of country which I have carefully inspected, and which I have traversed no less than four times during the last seven months.

The country under review lies between the Murray and the Billabong, and extends from near Deniliquin to some distance east of Urana, and contains about a million acres.

This area is comprised within the boundaries of some ten or twelve large holdings, interspersed among the boundaries of which are a number of smaller properties.

Some years ago this area of land was heavily infested, and about two-thirds of it consists of heavily-timbered forest country on which the timber has been killed for years.

During a careful inspection of the million acres of land under notice, I only saw *one* rabbit. I do not say there were no rabbits, for I saw scratchings, but they were so scarce I saw only one. It may be said, as has, indeed, been said to me, that I inspected this piece of country immediately after the severest drought experienced for sixty years, and that if I now went back over the same land I would give a different report.

Well, I had quite lately to go back in the course of my duties, and although there was in most parts luxuriant and succulent pasturage, I did not see one rabbit, and I was assured that there had been no increase of the pest. At the same time on some holdings not yet netted, and where the pest has not been dealt with in a stringent manner, there were plenty of rabbits.

A very notable success has been achieved, and achieved, too, where one would least expect it, viz., in heavily timbered country and on holdings embracing from 30,000 to 180,000 acres.

That rabbits should be reduced to a minimum on netted-in holdings ranging from 2,000 to 5,000 acres would not surprise anyone, but that rabbits can be reduced on holdings of so great an area, and on timbered country, cannot but inspire landowners in the Central Division with good hope, and, let us trust, with determination to get the pest down, and to keep it down.

Before going any further I wish here to repeat that I am only dealing with that portion of Riverina which came under my own personal observation, and that I am quite aware there is a large area of land north of the Billabong, on which landowners have been equally successful in dealing with the pest; in fact, one large holding on the Yanko, which was netted in early in the spring, has, I understand, never been infested.

This by the way.

The means that have been adopted with such notable success are very simple indeed. When rabbits are thick, poisoned water and poisoned pollard, and every other means that can be adopted, will, of course, be brought into force, and in order that there shall not be an influx from the land of careless owners, travelling stock routes, Government reserves, and town commons, every owner who is determined to get rid of the pest will, of course, net his boundaries; this goes without saying. In spite of what a few owners may say as to netting being unnecessary, I find that nineteen out of twenty landowners, small and large, are unanimous in advocating the necessity of netting.

But the first thing a landowner has to do, even before he nets his holding, is to clear off all harbour, logs, heads of trees and brush, &c., and then dig out, or, at any rate, destroy all burrows. When this is done, it will be found that the cost of dealing with the pest has been reduced to a mere item, and by item I mean a cost of, say, about 30s. per 1,000 acres. It is by these simple means that the land under review has been cleared and kept clear of the pest. A rabbiter with a pack of dogs to, say, every 50,000 acres, is all that is now required, and on one large holding of 100,000 acres, I found not even one rabbiter had been required for the last twelve months.

As to the cost, it need not be great. The manager of almost the largest holding in Riverina, comprising nearly 200,000 acres (part of the land under notice), very kindly allowed me to take from the station books the cost of coping with the rabbits for twelve years prior to the present year, and the figures are as follows:—1891, £203; 1892, £125; 1893, £110; 1894, £279; 1895, £424; 1896, £454; 1897, £393; 1898, £261; 1899, £318; 1900, £311; 1901, £443; 1902, £328—or an average of £304 per annum (about 30s. per 1,000 acres). It will not cost much over 15s. per 1,000 acres to keep the pest in check in future.

The above includes all expenses except burning off dead timber and netting the holding. These expenses are not included, because burning off pays for itself, and a netting fence "makes such good neighbours," and is such a valuable boundary fence, that most owners of large holdings are glad of an excuse to erect it. At any rate until all owners burn off harbour and dig out burrows, and deal trenchantly with the pest, netting is indispensable.

I have not alluded to the Western Division, but *if* it would pay to do it, and *if all* would join, and *if* there were no abandoned country, then I have no doubt that even in the Western Division, the pest could be reduced also to an "item."

How rabbits are to be dealt with in rocky mountainous, well-watered country is a problem I cannot pretend to solve, but all men agree with me when I say that it was almost criminal to allow the pest to effect an entrance into the Eastern Division, and only landowners themselves are to blame.

If any of your readers think I am too optimistic as to what has been and what can be done in getting rid of the pest, I refer them to the managers of Tuppal, Hartwood, Coree, Wonnamurra, S. Yathong, Gum Swamp, Nowranie, Mahonga, etc., these gentlemen will, I am certain, confirm all I have said.

The new Rabbit Act if well administered and its provisions faithfully carried out should be a great help in getting rid of the pest in the Central Division.

With regard to netting, nineteen out of twenty landowners, small and large, say it is absolutely necessary.

If *all* owners would clear off harbour and dig out burrows, etc.; if T.S.Rs., reserves, and town commons were kept free of the pest, netting would not be required, but the millenium has not yet come.

Before concluding I may state that last year I inspected and valued holdings comprising some 4,000,000 acres in the land district of Tamworth and part of Moree, and I did not see fifty rabbits; but the drought was very severe, and this country had never been at all heavily infested. It is very much to let landowners in districts that have not yet suffered much know how notably owners in Southern Riverina have succeeded in dealing with the pest that I send you this.—*The Pastoralists' Review.*

ABORTION IN MARES.

By Dr. Morrison.

In response to a letter written by a farmer in the Newcastle District, in which complaints were made of the prevalence of abortion in mares, the Government Botanist was asked if he could give any reason for this, and if it was caused through eating any particular plant. Dr. Morrison, in reply, states:—

"Having paid a visit to Walkaway and made inquiries of some of the residents there as to the circumstances attending the prevalent abortion of mares, and as to the possible connection of poison plants with its occurrence, I beg to offer the following observations:—

"It may be mentioned, at the outset, that in making an inquiry into the subject of abortion in mares the symptoms shown by the mare during the course of the abortion, and also the condition of the foal when born, should be correctly ascertained, for to the ordinary signs of labour there may be superadded other symptoms referable to poisoning. Mr. Hammersley informed me that the foal is dead when born, and in that case the question of the length of time it had been dead would have important bearings. A dead fœtus in the womb would be sure to cause abortion sooner or later, but its expulsion may be delayed until some other cause, such as the eating of poison by the mare, or nervous shock, serves to excite the uterus into action. It is possible that a dose of poison, that would not seriously endanger the life of the mother, may cause the death of the fœtus or bring on premature labour.

"These remarks are made in order to indicate the points to which the settlers in the Walkaway District may be directed. Facts, correctly observed, are required to decide the question as to the cause of the abortion; and they are not in a position to observe them unless a veterinary surgeon is present. Experiments made on animals in order to ascertain the action of the native poisons on the pregnant uterus would greatly help to a correct conclusion.

"Although there are few of the known poison plants to be seen on the cultivated fields of the Greenough district, some of them are known to exist in the vicinity, so that there is always a possibility that mares may browse on them and suffer from their effects. On the other hand, I was told that at stations further inland, where poison plants are at least as plentiful, mares in foal are not subject to abortion.

"From what is known of the native leguminous poisons, such as York Road, Box, etc., their action on the animal economy is such as would at least favour or assist in bringing on abortion in a pregnant animal, if they did not of themselves act as an efficient cause. The same may be said of *Anthœircis littorea*, a coastal shrub common near Perth, and found on the sandhills behind Geraldton.

This plant grows also about the Greenough Flats, but its poisonous character is not generally known. Cases of poisoning of children from eating the berries or flowers have occurred, the symptons produced by it being similar to that of belladonna poisoning. Another poison spoken of as growing near Walkaway is the poison plum, and its effects are described as very deadly, but I have not seen the plant, and do not know its identity. The presence of Ergot of Rye, which excites contractions of the uterus, does not appear to be known, and, so far, I have not heard of its being found in this State. The ingestion of any of these plants by a pregnant mare would be likely to bring on abortion, along with other symptoms of poisoning, but the proof of their being the cause does not lie in the presence of them in the locality. It is necessary to know that the animal had eaten the poison shortly before the abortion came on, and the ordinary symptoms of poisoning would also have to be looked for."

MANURES AND HOW TO MIX THEM.

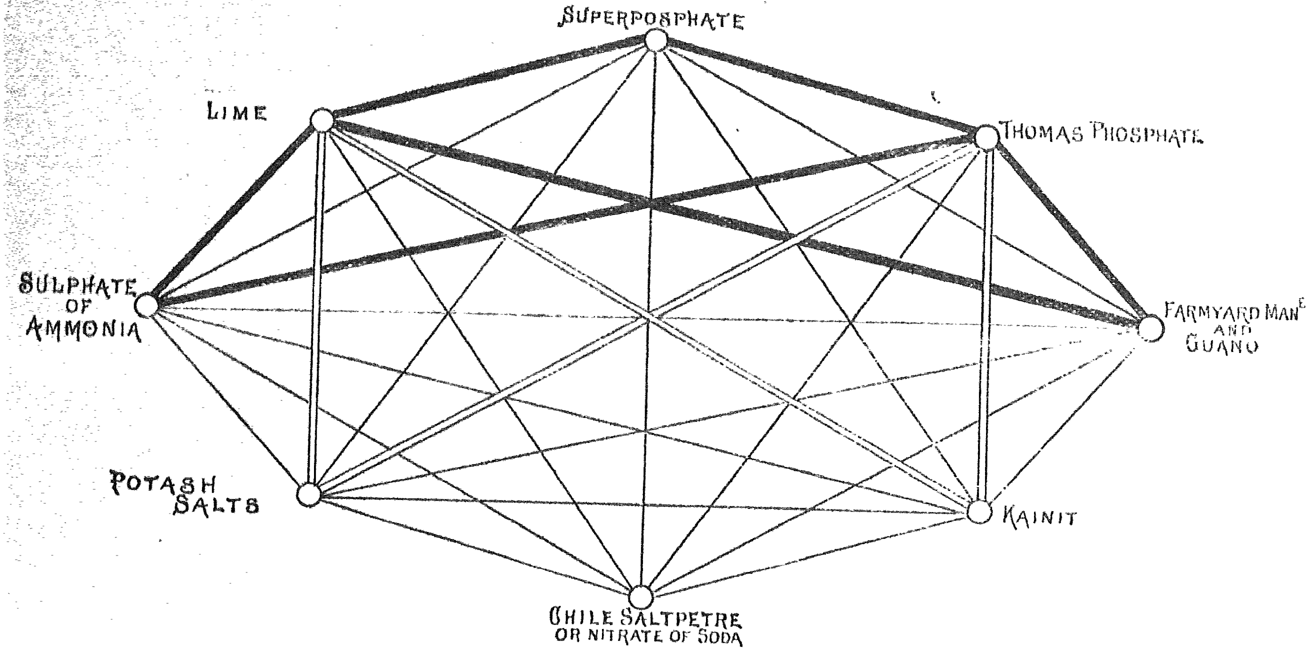
By LEO. BURING in the *Garden and Field.*

In mixing manures before applying same on the land, chemical changes can take place, so that a valuable ingredient may be lost by a part of it flying off as gas, as example, the mixing of lime manures with such that contain nitrogen, as stable manure, guano, or ammonium sulphate, when the most valuable ingredient. the nitrogen, is lost in the form of ammonia; or an easily soluble manure changes into one difficultly soluble, and so loses in value, as example, the influence of lime on easily soluble phosphates.

Secondly, mechanical changes can be caused by mixing two or more manures, and so make their application more difficult, and consequently more costly. Mixing kainit or other potash salts with other artificial manures, if not spread immediately, will give a mixture that soon becomes a hard, solid mass, which must be broken up before application.

To remember what manures can be mixed for any length of time, shortly, or not at all, before spreading the same on the land, cannot be expected of anyone who is not well up in the chemistry of manures. The accompanying diagram, which can be relied upon, is valuable for reference. For this purpose it can be tacked on the barn door, and everyone can see at a glance what manures can be mixed, and how long before speading same on the land.

Those manures joined by the thick lines must never be mixed before using; those by the double line, immediately before spreading; and those by the single line can be mixed together at any time.—Dr. Geekens, Alzey, Germany.



MANURES, AND HOW TO MIX THEM.

Those manures joined by the thick lines must never be mixed before using; those joined by the double lines immediately before spreading, and those joined by single lines may be mixed at any time.

STUD BULLS.

COPY OF AGREEMENT TO BE SIGNED BEFORE TAKING OVER STUD BULLS.

MEMORANDUM OF AGREEMENT made this......................day of ....between the Hon. the Minister for Lands, on behalf of the Department of Agriculture, and.......................
....

The said..in consideration of being lent the..................bull...................................... hereby agrees to pay to the Department the sum of £4, and to keep the said bull, free of all cost to the Department of Agriculture, in a secure and separate enclosure from all other stock, and to feed him and keep him in good condition. The bull to be kept for a period of twelve months from date of receipt, unless otherwise agreed upon.

The bull to be at service of any cow in the district, on payment of a fee not to exceed 2s. 6d. (two shillings and sixpence), such fees to be retained by, and become the property of the said
....

The bull is not to serve more than two cows in one day, nor more than thirty in one month, and not to serve more than once to a cow at each service.

The name and address of the owner, and the name and brand of each cow, including those belonging to the said....................
....
must be properly recorded at the time of service, and a list of such records forwarded to the Department of Agriculture when the bull is delivered up.

In all matters regarding the bull, instructions given by the Director of Agriculture, or other officer authorised by the Minister for Lands, must be carried out at once to his satisfaction, and the Minister reserves the right to remove the bull if satisfied that he is not receiving proper treatment.

The said..also agrees to pay cost of carriage of bull from................................ to..............................and to deliver him at the nearest railway station free of charge.

I agree to the above conditions, herewith forward the sum of Four pounds (£4) as specified above.

Signature,

EXPERIENCE WITH ANGORAS.

H. T. Fuchs, of Tiger Mills. Tex., writing in the *American Angora*, says:—

"There is no doubt that the goats are brush land clearers, but the animals need some assistance in their work.

"I find that it is necessary to bend down all the larger brush, that which is too tall to allow the Angoras to reach the top branches. This bending down is best done by cutting the larger brush and young trees about half in two near the ground on the upper side of the tree, and if the tree is then bent down the bark on the lower side will generally remain uninjured and the tree will continue to live for several years. It will then die and the roots will rot out in shorter time than in any other way I have ever tried. The Angoras appear to be especially fond of eating the leaves, buds and small twigs of the trees that are bent down in this way. They seem to know it was done for them.

"By the repeated plundering of the trees of all their leaves the life of the tree is exhausted so thoroughly that all of the roots are sure to rot out.

"Long Kemp in Mohair.—I have never seen very long kemp except on low-grade goats, whose mothers were of the Maltese kind. If one uses only common does which are snow white and covered with short smooth hair of equal length all over the body, that is, with no long hair over the back bone, on the thigh or below the shoulder blade, then the kemp will be short. If the goats are shorn by hand most of the kemp will stay on the goats because it lies flat close to the body.

"We used to make saddle girths out of all the mohair which we sheared from the first, second, third, and fourth crosses, and in carding the mohair (with common wool cards) we noticed that the kemp would nearly all drop out, and the strands would look almost as nice as if they had been spun out of pure mohair. Our saddle girths were soon in great demand. The cow boys would never have any other kind, because these were so soft that they never hurt the horses, and at the same time they were stronger and more durable than any other girth. The girths sold readily at 75 cents. to $1 25 each. My wife and her two little boys made over 500 such girths 20 years ago, but as soon as our goat flock had only a few "grades" left, we found that it paid much better to sell not only the finest, but the whole clip at from 35 cents. to 45 cents. a pound.

"When the mohair became too valuable to use in saddle girths they made ladies' shawls with tassels around the edge out of the finer mohair. Everybody who saw them, exclaimed: "Oh, how beautiful!" and they sold at from $2 50 to $5 each. One of the most important points about mohair goods is their lightness. They keep one warm and they are so light that one hardly feels their weight.

"Some growers are of the opinion that it pays best to shear only once a year. They think they get more money for the clip, as the higher prices for the mohair makes up for the difference in weight. I claim that the higher prices for the 12 months' clip will never net as much money as two six months' clips at a lower price, for the following reasons:—

"Some of the long mohair is lost by shedding, and the loss by two six months' clips will exceed the weight of the year's clip at least one-third. The difference in price will hardly be one-fourth. Sometimes in a brushy country Angoras get wound up so tight that they need to be cut loose. Angoras suffer from heat even in winter, and they get lazy and sluggish. If they are sheared twice a year they will move around more lively and be better rustlers. If they have plenty of good range the amount of mohair will be nearly twice that of a twelve months' clip. In a twelve months' clip there will be more dirt than in two six months' clips, and the kemp which drops out of a six months' clip will remain in a twelve-months' clip. If there should be a few burrs, twigs of stickers in the fleece of an Angora with a six months' growth of mohair, one can pick out, for good prices, these foreign materials very easily before shearing with cheap labour. This is slow work after shearing. Another advantage is the greater ease with which the animal can be shorn. The shearers are in better humour and cut the goats less.

"In manufacturing plushes the mohair need not or should not be a twelve months' growth. If I am not mistaken the six months' growth is preferred for making plushes. In making dress goods the twelve months' growth is not needed.

"There is another great disadvantage in shearing only once a year, and this is that the Angoras, with their long mohair, oftener get their teeth caught in the mohair, and must have the mohair taken out from between their teeth."

CORRESPONDENCE.

INSECT PESTS IN CALIFORNIA.

To the Editor.

Sir,—In the August number of the *Journal* I notice statements in regard to the entomological situation in California, which are certainly very misleading.

California is exceedingly well provided with injurious insects, and their annual injuries aggregate many hundreds of thousands of dollars. Scale insect are very prominent in the list of injurious forms, and are by no means under control by their natural enemies.

A short time ago an attempt was made to determine the relative injury done by various insects, in order to so plan our work that we would accomplish the greatest good by directing our experiments towards the problems of most general concern. For this purpose inquiries were addressed to a large number of the leading fruitgrowers of the State, including also the Horticultural Commissions of most of the counties, asking for a list of the 10 most injurious insects. The following scale insects were so reported:—

Southern Counties.

San Diego.—*Coccus hesperidum, Saissetia oleæ, Euleacanium armeniacum, Aulacaspis rosæ, Aspidiotus perniciosus, A. hederæ, Lepidosaphes beckii.*

Orange.—*Saissetia oleæ, Lepidosaphes beckii, Aspidiotus perniciosus, Chrysomphalus aurantii.*

Los Angeles.—*Coccus hesperidum, Saissetia oleæ, Aulacaspis rosæ, Aspidiotus rapax, A. perniciosus, A. hederæ, Chrysomphalus aurantii.*

Riverside.—*Icerya purchasi, Coccus hesperidum, Saissetia oleæ, Aspidiotus rapax, A. perniciosus, Chrysomphalus aurantii.*

Ventura.—*Icerya purchasi, Sassetia oleæ, Lepidosaphes beckii, Aspidiotus perniciosus.*

Santa Barbara.—*Saissetia oleæ, Aspidiotus rapox, A. perniciosus.*

San Joaquim Valley Counties.

Tulare.—*Icerya purchasi, Eulecanium armeniacum.*

Kings.—*Eulecanium armeniacum, Aspidiotus perniciosus.*

Fresno.—*Icerya purchasi, Aspidiotus perniciosus.*

Madera.—*Coccus hesperidum, Aspidiotus perniciosus.*

Stanislaus.—*Icerya purchasi, Saissetia oleæ, Eulecanium armeniacum, Aspidiotus perniciosus.*

CENTRAL COAST COUNTIES.

Monterey.—*Saissetia oleæ, Lepidosaphes ulmi, Aspidiotus perniciosus.*

Santa Clara.—*Icerya purchasi, Saissetia oleæ, Eulecanium armeniacum, Aspidiotus perniciosus.*

San Mateo.—*Icerya purchasi.*

Alameda.—*Saissetia oleæ, Eulecanium armeniacum, Aspidiotus rapax, A. perniciosus.*

Contra Costa.—*Saissetia oleæ, Eulecanium armeniacum.*

CENTRAL AND NORTHERN COUNTIES.

Sacramento.—*Coccus hesperidum.*

Placer.—*Aspidiotus perniciosus.*

El Dorado.—*Aspidiotus perniciosus.*

Sonoma.—*Saissetia oleæ, Eulecanium armeniacum, Aspidiotus perniciosus.*

Trinity.—*Aspidiotus perniciosus.*

Humboldt.—*Lepidosaphes ulmi, Aspidiotus perniciosus.*

Siskiyou.—*Aspidiotus perniciosus.*

Lassen.—*Aspidiotus perniciosus.*

I give the above data rather fully so it may be seen how widespread the scale insects are in destructive numbers, and it must be remembered that this data is the deliberate judgment of our leading horticulturists as to the most injurious insects in their respective regions.

The cottony cushion scale, *Icerya purchasi*, is the only insect fairly well kept in check by imported enemies, but enough time often elapses before the *Vedalia* increases enough to control it that in six counties it was reported among the ten most injurious.

The soft brown scale, *Coccus hesperidum*, is usually kept in check by native enemies, or at least by enemies which were not intentionally imported. It is reported as highly injurious in four counties. It has become neither worse nor better during the last 13 years, during which it has been under the writer's observation.

The black scale, *Saissetia oleæ*, is probably the most injurious scale in California. The most evident loss it occasions is on citrus trees, through the smutting of the fruit on which its excretions fall. Something like a hundred thousand dollars are expended each year in four southern counties for cyanide used in fumigation for this insect, in addition to the cost of spraying operations, upon which it is hard to obtain figures. The loss in vigour in infested trees is very great, but the amount of this loss cannot be accurately estimated. It is highly injurious in all the coast counties, unless it be the extreme north. There seemed at one time to be ground for the hope that the imported ladybird *Rhizobius ventralis,* would prove of value in destroying this pest, but only in one or two small localities has it appeared to be effective. At the present time we are hoping also that the African *Scutellista cyanea* will amount to something. The many accounts of effective work by these and other enemies of the black scale have been based solely on hope instead of an accomplishment.

The brown apricot scale, *Eulecanium armeniacum,* attacks deciduous fruits, and is reported as highly injurious from eight counties. Quite a number of parasitic and predaceous insects are known to attack it, and occasionally appear to be quite effective. They have not appreciably reduced the total numbers, however, judging from the correspondence of the Entomological Department.

The purple scale, *Lepidosaphes beckii,* is reported from three counties, is highly injurious, but fortunately not known in most of of the orange-growing localities.

The oyster-shell scale, *Lepidosaphes ulmi,* is reported as highly injurious from only two counties, but occurs in all apple-growing sections. It is not as injurious as the scales previously mentioned, or would have been reported oftener.

The rose scale, *Aulacaspis rosæ,* occurs all over the State, and is capable of doing considerable injury. It does not attack plants of great commercial importance, and so is reported from only two counties.

The greedy scale, *Aspidiotus rapax,* is one of the commonest scale insects in the State, but seems to injure the plants affected to less degree than the other species mentioned below, and is reported as highly injurious from only four counties.

Aspidiotus hederæ is reported from two Southern counties. It occurs, however, in greater or less numbers all over the State, and is commonly confused with other more abundant and more destructive members of the genus. These last four species simply hold their own, varying a little from year to year, and have not been observably influenced by any of the importations of beneficial insects.

The San José scale, *Aspidiotus perniciosus,* is the most injurious insect on fruit trees in the interior, and is next to the black scale on the coast. Its effect on the life of the tree is more serious than the latter, but it is so completely controlled by spraying with lime, salt, and sulphur that orchardists do not fear it. They understand fully, however, how serious it would be without spraying, as is shown by the report from twenty counties given above. There are some localities where the insect does not seem to be able to exist. I cannot learn that it has ever been injurious at Berkeley, though but a short distance away, in the same county, it is sometimes very injurious. At San José, where it was first discovered, it is by no means abundant, and not commonly injurious. The diminished numbers at San José, and the entire absence of the species at Berkeley, is not due to any introduced parasite, and, whenever such a claim is made, care is taken not to name the parasite, nor the time of its introduction, and the Commissioner of Horticulture has never distributed a parasite for this scale.

At one of the recent meetings of the State Association of Horticultural Commissioners the writer inquired as to what insect they gave the most attention to in their nursery and orchard inspection, it was the unanimous reply that the San José scale was the one. The Commissioners from the citrus regions were not present at this meeting or it might not have been unanimous, but it was a well attended meeting.

The red scale, *Chrysomphalus aurantii*, is reported from three southern counties, where it is quite injurious on citrus trees. The form known as the yellow scale is often heavily parasitised and is usually considered as not injurious, though authorities often differ as to whether any particular lot are red or yellow. The situation in regard to this scale has not changed materially during the last dozen years, and no imported parasite has entered into the problem.

The actual practice in this State is as follows:—

(1.) For the Cottony Cushion Scale we depend upon introducing a colony of its enemies into an infected locality.

(2.) For the Black Scale and the Brown Apricot Scale this method is being experimented with, but as yet without appreciable results in most cases at least, so that where results are imperative spraying or fumigation is resorted to.

(3.) In the case of citrus trees the treatment most relied upon is fumigation with cyanide.

(4.) Distillate spraying is quite extensively used both for citrus and deciduous fruits.

(5.) The resin soap mixture for black and brown apricot is much used on deciduous trees; and

(6.) The lime, salt, and sulphur spray is practically the sole reliance against San José scale, applied like the last during the winter.

C. W. Woodworth.

University of California,
Berkeley, 20th October, 1903.

This letter was handed to our Entomologist, to which Mr. Compere replied as follows:—

To the Editor.

I have carefully read Mr. Woodworth's letter of 20th October, 1903. This letter would convey the impression that I had in the August number of the *Journal* made statements which are not borne out by facts. With reference to the insect pests of California, I stated in my report, which will be found on pages 140 and 141 of the *Journal* above referred to, that the trees upon which Mr. Craw had liberated the red scale parasites secured in China, had been cut out and burned by the owner of the trees, and this after he had promised not to spray or fumigate them in order to give the little parasites a chance to establish themselves; and I also stated that the San José scale is no longer a pest in that State, being held in complete subjection by the little parasite *(Aphelimus fuscipennis)*. In Madera county the scale had obtained a strong foothold before its presence was discovered. I cannot do better than quote from my report as follows:—

> The only orchards in that State which is now troubled with black scale (*Lecanium oleæ*) are those that would not listen to the advice of the State board a few years ago to let the parasites do the work of destroying it, instead of fumigation and spraying. The so-called South African parasite *Scutellista cyanea* has become well established in that State; this alone will rid that State in the future of black scale. It is a remarkable fact that this valuable little parasite was not noticed years ago, as it has held this scale in subjection in Europe for more than a century. Mr. Tom. Hooper, of this department, on his return from England last year, *via* South Africa, was furnished with some of the parasites by Mr. Lounsbury, Government Entomologist of Cape of Good Hope. Unfortunately these perished before they could be liberated. However, some more are soon expected to arrive from that country. If we fail there we can have them sent from California.
>
> The brown apricot scale (*Lecanium armeniacum*), once a serious pest in California, is now a harmless form there; the yellow scale (*Aspidiotus citrinus*), also a serious pest of the citrus orchards in that State at one time; the soft brown scale (*Lecanium hesperidum*), also a troublesome pest once in that State; the various species of (*Dactylopius*) and cabbage butterfly (*Pieris rapæ*) are all held in complete subjection by their parasites there.

Mr. Woodworth, has not undertaken to dispute the correctness of the above statements on his own responsibility or knowledge of the question, but from inquiries sent out to growers and Horticultural Commissioners of most counties of that State, requesting them to name a list of the 10 most injurious insects. These inquiries, I presume, were to obtain the opinion of those addressed as to what they considered the most injurious insects, and, from the wording of Mr. Woodworth's letter, it would convey the impression that those mentioned are now pests in the counties named. I will now refer to the annual reports of the Horticultural Commissioners for the year 1901 and 1902, published in the eighth biennial report of the State Board of Horticulture for 1901 and 1902.

San Diego (page 228).—"The orchard pests are controlled by beneficial insects, fumigation with hydrocyanic acid gas, and, in some instances, on small trees by the use of sprays. Such species as the *Lecanium hesperidum*, *Aspidiotus perniciosus*, and all the species of aphides that we have here are pests of the past; as is also *Icerya purchasi*. There are instances where the black scale (*L. oleæ*) is fully controlled by beneficial insects; several species of ladybirds feed upon it. *Rhizobius ventralis* are sure to be found on trees infested with this species of scale. The little native internal parasite is found in most of our infested orchards, and is often very numerous. Its work does not appear to be complete, as only a small amount of the eggs produced by the black scale is required for its subsistence.—(Signed) F. AUSTIN, Secretary."

Orange (page 222).—"The practice of fighting insect pests by fumigation of orchards once each year has reduced the red scale to a minimum, and a minute yellow fly which is present this season in great numbers, in many instances has proved as destructive to the red scale as fumigation. We therefore believe that the treatment of orchards for red scale will soon become unnecessary. But while the above treatment has been satisfactory as against the red scale, the same cannot be said of the warfare against the black scale, which, owing to its different life history and the fact that fumigation does not devitalize the egg, has been gradually increasing for four or five years, until now the presence of this insect presents quite a serious aspect, as the cost of fumigation twice each year is almost prohibitive. The purple scale has been found in three or four very limited areas, but energetic measures have been adopted, with the hope of exterminating it. Beneficial insects, while not numerous, are much more so than in the past.—(Signed) A. D. BISHOP, Secretary."

Riverside (page 225).—"The work of eradication of insect pests, embracing the methods of fumigation, spraying, and the colonisation of parasitic insects, comprised the treatment of 27,718 trees. Nearly all such work has been done under the supervision of the Commission. Fumigation was employed upon 12,659 infested trees, and 15,000 trees were sprayed with the several insecticides, principally distillate, which has finally and thoroughly demonstrated its efficacy. The parasitic insects employed include *Vedalia cardinalis*, *Rhizobius ventralis* and *toowomba*, *Scutellista cyanea*, and a new *Proctotrupidæ*, parasite of the San José scale. —(Signed) W. F. BUDLONG, Secretary."

Ventura (page 238).—"*Rhizobius ventralis* is keeping the black and hemispherical scales pretty well cleaned out near the coast, but in some localities farther inland the laced winged fly larvæ are so numerous that they keep down the *Rhizobius*. We are very anxious to get the new South African parasite, *Scutellista cyanea*, introduced where the *Rhizobius* fails, in the hope that the two together will clean up the whole county. So little San José scale appeared on deciduous fruits that we did not think it advisable to order a tree to tree inspection of these trees. We rely entirely on *Vedalia cardinalis* to eradicate the cottony cushion scale, and very few of these scales can be found in the county.—(Signed) J. F. MCINTYRE, W. R. RICE, J. B. ALVORD, Commissioners."

Santa Barbara (page 231).—"The fumigation and spraying of last year reduced the amount of scale to a very great extent. Although fumigation seemed to be effectual at the time, we find that the Florida purple scale has re-appeared this season in the trees operated upon twice last year, and has spread somewhat. The

Rhizobiids, the *Orcus*, and other beneficial insects have done much in some localities to keep the various scales in check. There will be very little fumigation in this county the present season, most of the growers relying on spraying and the various ladybirds and flies, as the matter of expense must be considered when the price of fruit is low. The olive trees have been well supplied with *Rhizobiids Ventralis*, and generally have been in a clean and healthy condition.—(Signed) C. J. Russell, Joseph Dimmick, T. N. Snow, Commissioners."

Tulare (page 237).—"The brown apricot scale is nearly, if not quite, gone clean out by the lime, salt, and sulphur wash and by the *Comy fusca*, introduced in this counry four years ago. The ladybird (*Vedalia cardinalis*) has cleaned out the cottony cushion scale. In fact, very little scale can be found in the large citrus orchards. Wherever any are found this Commission has placed a colony of this beneficial insect.—(Signed) Perry Fowler, S. A. Baggs, C. S. Riley, Commissioners."

Fresno (page 217).—"The citrus fruits from this section are remarkably early and free from smut, scale, and all insect pests. The orchards of the county are, generally speaking, well cared for and reasonably free from disease and insect pests.—(Signed) W. D. Weaver, Secretary."

Madera (page 220).—"The San José scale has secured a strong hold in our county in several places. While we have done much to eradicate it, we find many of the orchardists rebel at being served with notices to spray.—(Signed) W. M. Hughes."

Stanislaus (page 234).—"The San José scale seems to be decreasing very rapidly. The cottony cushion scale is kept in subjection by the *Vedalia cardinalis*. The brown apricot scale is increasing in some localities.—(Signed) W. F. Wheeler, J. N. Stuhr, A. L. Rutherford, Commissioners."

Monterey (page 221).—"There is very little San José scale to contend with, and it is well under control, as is also the black scale in the vicinity of San Ardo. We have to contend with the greedy and brown apricot scales, the woolly aphis, and red spider, with very little San José scale. The scales have been reduced by winter sprays.—(Signed) D. W. Rohrback, Secretary."

Santa Clara (page 231).—"Our fruit trees are infested with several scale insects; the pear *diaspis* (*Diaspis pyricola*) is the most abundant at present. The Olive scale (*Lecanium oleæ*) and the brown apricot scale (*Lecanium armeniacum*) are nearly subdued by their enemies, *Rhizobius ventralis and Comys fusca*. The use of beneficial insects as far as practicable has been my policy.—(Signed) E. W. Ehrhorn, Entomologist, Santa Clara county."

Alameda (page 215).—"The absence of insect pests has been remarkable. Thousands of young olive trees can now be seen at the Californian nursery, bright and clean, whereas two years ago they were black with smut; this has been brought about by the effective work of that valuable insect, *Rhizobius ventralis*, assisted by the internal parasites *Dilophogaster californica*. The brown apricot scale (*Lecanium armeniacum*) has been nearly cleaned out of the orchards by the internal parasites, *Comys fusca*. There has not been any spraying in this district since 1893, as we have depended entirely on the natural enemies of the different scales as above.—(Signed) WILLIAM BARRY, Commissioner."

Sacremento (page 226).—"Regarding insect pests in the orchards, the brown apricot scale, which was rapidly increasing, is more quickly disappearing since the parasite (*Comys fusca*) has become well established. Orchards that were badly infested with scale, and tested ten per cent. parasitised scale last season, are this season practically clean. We find the parasite well distributed throughout the county. (Signed) WILLIAM JOHNSTON, GEORGE H. CUTTER, F. M. GRIMSHAW, Commissioners."

Placer (page 223).—Make no mention of any scale insects in their report.

Hombolt (page 218).—"This section has been fortunate in escaping to a great extent any serious damage from scale of any kind. Along the belt lying in proximity to the coast, the weather conditions are such as to retard any rapid development of the San José or any other pernicious scales, and consequently there is, with the exception of oyster scale, hardly any to be found. In the warmer belt removed from the coast, San José scale existed to a limited extent for a number of years, and during the past few seasons developed quite rapidly, threatening several orchards with complete destruction.—(Signed) J. E. JANSSEN, Secretary."

Lassen (page 220).—Make no mention of any scale insects in their report.

It will be noticed that 16 out of the 20 counties mentioned by Mr. Woodworth, have reported to the State Board of Horticulture the condition of their respective districts, and I have quoted fully upon the question of scale insects, and the six counties in which Mr. Woodworth says the cotton cushion scale *Icerya purchasi* is yet reported as among the ten most injurious scale insects, all have been mentioned in the above list, and not a single one of them report this scale a pest, but on the other hand say it is held in complete subjection by the *Vedalia*. During my visit to California last January, Mr. Alexander Craw, of the then State Board of Horticulture, was writing to the Commissioners all over the State inquiring for *Icyera* with which to feed his ladybirds in the breeding jars and so keep them alive. According to Mr. Woodworth's letter there are four counties in which he states that *Lecanium*, or as he calls it *Coccus hesperidum*, is highly injurious. In three out of the four counties named by him, the insect is not even mentioned by the Commissioners, while one county mentions it as a thing of the past, and this is San Diego. Whether the parasite was intentionally imported or not, the fact remains that it has rid the State of a serious pest, at least to such an extent that it is no longer noticed. San José scale *(Aspidiotus perniciosus)*, according to Mr. Woodworth, is the most injurious insect on fruit trees in the interior of California, and out of the twenty counties he cites in the report of the Commissioners of nine of these counties, there is not even a mention made of this scale, while San Diego mention it as a thing of the past owing to the effect of its parasite; in Ventura, so little was reported that the Commissioners did not deem it necessary to cause an inspection of the orchards. In Stanislaus, it is reported as decreasing rapidly. Monteray, the Commissioners say there is very little to contend with. Humbolt, it is reported as common in one section of the county, and the only county in which it is reported a pest is Madera county, and this I so stated in my report. Berkeley, where the University is situated, is in Alameda county, and the following is the Commissioners report to the Supervisors of that county last January:—

INSECTS SAVE SPRAYING.

Immense Savings to Orchardists through work of Imported Bugs.

The following interesting report on the work of beneficial insects in saving time, labour, and money in spraying orchards to keep the fruit clean was presented to the Supervisors Monday:

GENTLEMEN,—In this, my annual report, I will endeavour to give an estimate of the horticultural interests and the extent of the fruit industry in this part of the Alameda county.

The new internal parasite of the black scale (*Scutellista cyanea*), lately imported by the State Board of Horticulture from South Africa, bids fair to be one of the most valuable insects introduced into California. Last April I received from Mr. Craw, State quarantine officer, about 30 of these insects and placed them in the orange grove and olives of H. A. Mayhew of Niles, and on the 18th of September I cut enough twigs to fill four two-quart jars, from which I hatched out 149 parasites. These I placed in different localities in Washington township, and at Sunol in Murray township. I hope they will give enough increase to commence placing them in deciduous orchards the coming year.

There has not been any spraying done in this district since 1893, and it is a singular fact that no estimate in the saving in dollars and cents has been made during the past nine years. Upon a suggestion made to me I consulted some of the leading orchardists as to what they considered the cost of spraying was at the time it was practised. My estimate being much lower than theirs, I give it, as follows:—

There are 1,996 acres of commercial orchards in the district—not counting orchards of less than five acres— I deduct 400 acres for cherries and almonds, leaving 1,596 acres, and I find the saving—for labour and material alone—to be $19,152 per year, or a total of $172,368 for nine years. This is quite a neat sum to be placed to the credit of the beneficial insects.

In the above estimate no consideration is taken of the orange and lemon groves, nor of the thousands of olive and ornamental trees in the district, or the money spent in futile efforts to keep them clean. Even now it takes close application with the assistance of the beneficial insects to keep the trees and fruit in their present clean condition. Before the introduction of the insects it cost Mr. McIvor of Mission San José $800 a year in his attempt to keep the scale in subjection on his orange, lemon, olive, and ornamental trees. Now they are bright and clean without cost. William Barry, Horticultural Commissioner of Alameda county.

This report shows that there has been no spraying there since 1893, and whether the Commissioner names the parasite or introduced it or not, the fact remains that the little Japanese parasite (*Aphelinus fucipennis*) is responsible for the absence of the scale there, and I have in my collection specimens of this little parasite reared from San José scale taken in that county years ago.

Yellow scale (*Aspidiotus citrinus*).—Mr. Woodworth admits it to be heavily parasitised and not injurious, but forgets to mention that it was at one time the most injurious pest with which the citrus growers had to contend with in Southern California.

Brown apricot scale (*Lecanium armeniacum*).— Mr. Woodworth states it is highly injurious in eight counties, but the commissioners of 12 that he mentioned do not even refer to this scale in their reports; Sacramento commissioners say it is being cleaned out by the parasite; Santa Clara—the entomologist states it is subdued by the parasite; Tulare—they report it cleaned out by spray and parasites; while in Stanislaus the commission report it increasing in some localities.

Black scale (*Lecanium oleæ*).—I stated in my report that it was only a pest in those localities where they would not heed the advice of the State Board of Horticulture, by leaving that scale to the parasites, and those that did do so have now clean districts to report without cost. I also stated that the South African parasite (*Scutellista syanea*) had become well established in that State, and for further information with reference to this, the following from the *San Francisco Weekly Chronicle*, 24th September, 1903, will be of some interest:—

BLACK SCALE IS BEING WIPED OUT.

San Jose, September 18.—Deputy State Commissioner of Horticulture Alexander Craw and County Horticultural Commissioner Edward M. Ehrhorn spent the last day or two visiting the orchards in the western and central portions of the valley to ascertain what progress is being made by the African parasite (*Scutellista syanea*) which was imported for the destruction of the black or olive scale (*Lecaneum olia*), which for many years has been a serious pest in the citrus orchards of the south and the deciduous orchards of Central and Northern California. They have returned highly gratified with the result of their inspection, having found that the parasite has adapted itself to its new surroundings and is flourishing, with disastrous consequences to the scale that is its particular prey.

Mr. Ehrhorn was the first to import this parasite here from Africa about three years ago. He judiciously placed colonies of the insects in the valley, but subsequent investigation failed to show any trace of them. Professor Craw meanwhile received shipments of them from Africa, propagated them carefully under glass at San Francisco, and distributed them throughout the State, including points in this valley. Ehrhorn also has had success with subsequent broods at his home in Mountain View, and those placed out by him were found yesterday thriving both in citrus and deciduous orchards. At present the colonies are being reinforced by being placed on orange trees, and by next spring they will be ready to enter the deciduous orchards in large numbers, to do good work.

The black scale is found on all kinds of trees and shrubs--peaches apricots, pepper trees, prunes, oleanders, etc., as well as on olives. lemon, and orange trees. The parasite is different in its habits from the apricot brown scale parasite, which is a true internal parasite and feeds upon the body of the scale, thus destroying it and shutting off the possibility of more scale eggs. The black scale parasite, however, is what is known as an egg parasite, which lays its eggs among those of the black scale. The brown scale parasite produces only a single brood, while a new brood of the black scale parasite appears about every 47 days. The former has been immensely effective, as is universally known, and the latter is nearly eight times more prolific, so it looks now as if the black scale will, in a few years, be a thing of the past, so far as California is concerned.

SCUTELLISTA CYANEA.

Progress of the Black Scale Parasite in California.

The following is an official report by Deputy Commissioner Craw on the progress of the new black scale parasite :—

To Ellwood Cooper, State Commissioner of Horticulture :—I herewith submit a brief report of my investigation into the condition of the South African internal parasite (*Scutellista cyanea*) of the black scale, referred to and figured on pages 91 and 92 of the "Eighth Biennial Report of the State Board of Horticulture."

According to your instructions, I left San Francisco on the evening of July 9th, visited Santa Barbara, and at Mr. Gillespie's beautiful place in Montecito, I found the parasite thoroughly established and spreading naturally over a distance of 150 yards from where the colony was placed on a mesquite tree. The superintendent, Mr. Compton, and Commissioner Snow have undertaken the distribution of the parasites to other parts of the estate and other districts in the county.

In Ventura county Commissioner J. F. McIntyre has established them out of doors, and is also propagating them in confinement. The pepper is used extensively in Ventura as a shade tree on the streets and avenues, and a few years ago these trees were seriously infested with "black" and "hemispherical" scale. Being located near the coast, the "Australian black ladybird" (*Rhizobius ventralis*) has done good work in checking both scales, and in this county they are not so troublesome.

In Los Angeles the *Scutellista* has become well established. One year ago the olive grove of W. E. Hughes, located about six miles south-west of the city of Los Angeles, was very seriously infested with "black" scale, and the foliage and twigs were covered with black smut. On June 9, 1902, I requested Mr. Hughes not to spray his trees, and sent him a colony of *Scutellista*, with instructions about colonising them in his orchard. As it is an extensive grove—half-a-mile long by a quarter of a mile wide—it was an ideal place to make a thorough test of the new parasite, so I forwarded him six colonies.

On July 4, 1902, larva and pupæ of the *Scutellista* were found in the scales where the first colony was liberated. On July 3, 1902, Mr. Hughes wrote: "I am glad to be able to report this morning that the *Scutellista* has made its appearance generally throughout my orchard, thus proving its ability to winter successfully in Southern California. I regard this as a matter of great importance to the fruit-growers of the State, as it seems to number the days of the black scale pest. There can be no doubt as to the ability of the *Scutellista* to destroy the black scale rapidly, when once t has been generally distributed throughout the infested districts. I desire o acknowledge my indebtedness for the benefits which I have derived."

On July 16th, in company with Mr. Hughes and Horticultural Commissioners Jeffrey and Strong, I visited the orchard and found the *Scutellista* had done and was still doing splendid work, very little scale remaining, and the foliage and twigs were clean and bright. Mr. Hughes kindly granted permission to the County Horticultural Commissioners to collect colonies from his orchard for distribution to other places.

In the lemon and orange groves of J. Thomas of Monrovia I found the *Scutellista* well established and reducing the scale, so that the trees are bright and clean. The grand old pepper trees along Morengo avenue, as well as others, in Pasadena, had long been an attractive feature and a pleasure to Eastern visitors and residents of Pasadena for the delightful shade and pleasing green of their foliage and the contrast of their bright red berries.

Within recent years the black scale had taken such complete possession of them that their foliage was scant and they had proved a veritable breeding place for the scale. Their size and location made it difficult to spray or fumigate them, and the County Commissioners had commenced a fight of extermination. On August 25 and 31, 1902, I sent Horticultural Inspector C. A. Day two colonies of *Scutellista*, which he liberated on a pepper tree on South Morengo avenue, and during my recent visit we found the insects widely spread on the pepper trees, and also found them in scale on citrus trees, oleanders, and other plants. Over 90 per cent. of the scales were killed by the parasites. Mr. Day reported finding them breeding in October, December, March, April, June, and July. On August 21st Commissioner Jeffrey wrote me that he had distributed from the Morengo-avenue source this month about 400 colonies, and adds that his Commission "cannot begin to fill the applications for them." "You would not believe the interest that this insect has engendered here among the citrus fruit growers."

At Asuza we found the Scutellista doing well in the extensive orange groves of H. L. MacNeill, from two colonies sent from this office last December. The superintendent, J. T. Lindley, stated that he would distribute the parasites throughout their orchards and give them every chance. At Dr. A. E. Englehardt's place in Glendora I found the parasites established and spreading. At Ontario we found a few on the place of Mr. Lawson, and at Riverside on a grape fruit and an orange tree from a colony sent to Commissioner Cundiff. From two colonies sent to Dr. W. B. Wall of Santa Ana he has been very successful. The Orange county Horticultural Commissioners, Messrs. Bishop, Rafferty, and Nebelung, visited with me Dr. Wall's extensive orange grove, and in nearly every scale we found a parasite, or the hole in the scale where one had made its visit. Dr. Wall has expedited the good work by collecting and distributing the parasites throughout his grove, and has also sent colonies to his friends.

I next visited Escondido valley, where I witnessed most gratifying results from the work of the parasite. I found them in B. F. Dixon's place, at the head of the valley. These were from a colony sent to Horticultural Commissioner F. Austin on August 26, 1902, and which had showed wonderful powers of reproduction and had spread rapidly.

Mr. Austin placed the colony we sent him upon a grapefruit tree, and from this the parasites had spread to orange, lemon, pear, prune, pepper, and other trees and plants infested with black scale for a distance of over half a mile. Mr. Austin is now distributing the parasites in other districts. He is confident that the *Scutellista* will have complete control of the black scale in another season. At San Diego Horticultural Commissioner C. C. Jobes of San Diego and I visited Point Loma and found that the parasites have practically destroyed the scale in the large olive orchard of W. A. Chamberlain. It was a rare occurrence to remove a live scale without finding a small maggot of the *Scutellista* at work devouring it, or rather its eggs.

We next visited the grove of C. K. Clift and found the parasites plentiful. As the trees were thrifty, the scales and parasites were correspondingly well developed. It is interesting to note that when a female *Scutellista* deposits an egg in a small but mature scale, the parasite raised from it will be perfect in every respect but size.

I visited Hollywood and Colegrove districts with Commissioner Meserve, but found no trace of *Scutellista*. E. C. Harrington received several colonies, but his orchard was fumigated twice last season and at the time of my visit (August 25th) his orange trees were very seriously infested. About a half-mile from Mr. Harrington's is the orange grove of Mr. Wilson. Here we found *Rhizobius ventralis*, larvæ and eggs, and very little scale. Mr. Wilson had done no fumigating or spraying, but had relied upon beneficial insects.

As stated by Mr. Jeffrey, "the interest that this insect (*Scutellista cyanea*) has engendered is great." It reminds one of the time when we were breeding and distributing the *Vedalia cardinalis* for the "cottony cushion scale."

We have still, however, to spray or fumigate for the "purple scale," where it has secured a foothold. We know where its parasite exists, but it requires money to secure it.

Another insect pest that you have frequently advised the necessity of securing an appropriation to find its enemy is the "codlin moth." In a recent letter from George Compere, now collecting insects (beneficial) for the Western Australian Government, he writes me that he has found a parasite of this pest that destroys over 90 per cent. of them. Of course, this is a long way from extermination, but it would help to control it, and it is as much as our best sprayers claim to kill. Respectfully submitted.—ALEXANDER CRAW, Deputy Horticultural Commissioner.—(*San Francisco Weekly Chronicle.*)

Of the other scale insects mentioned by Mr. Woodworth, I did not refer to them in my report, as so far no parasites had been introduced to attack them, and my remarks concerning the others are fully borne out by the reports of the Horticultural Commissioners of the 16 counties, and are not misleading but are facts. And I am indeed sorry that Mr. Woodworth has not given us his personal knowledge of the entomological conditions there, and also his experience with the first colony of *Rhizobius ventralis* furnished him by the State Board, where he liberated them, and what they accomplished, as it would no doubt be interesting.

G. COMPERE,
Government Entomologist.

Department of Agriculture,
Perth, 4th December, 1903.

[If it is Mr. Woodworth's intention to advocate fumigation as against the use of natural enemies, then we are afraid his own State publications are against him. It is too much to expect that when parasites are introduced into a State by the dozen only that any difference is likely to be seen for a time when the pest it is to attack number by the hundreds of millions. Time must be given for the parasites to increase, and once this is allowed, then fumigation must become a thing of the past. One question we would put to Mr. Woodworth, why is it that all those insects that are a destructive pest are almost unnoticeable in their original homes?—Ed. *Journal.*]

ALOES FOR FLAX.

Mr. Packard, of Coolgardie, has written enquiring as to the value of aloes for flax.

The matter being referred to the Government Botanist, Dr. Morrison replies as follows:—"The Sisal Hemp (*Agave rigida Sisalana*) is very like the common American aloe (*Agave Americana*), and appears to be as hardy. A quantity of young plants were imported by the department a few years ago, and distributed to various people. A year ago samples were received from Dr. F. Francanti, of the Southern California Acclimatising Association, Santa Barbara, California, offering plants at $10 per 1,000 delivered f.o.b. Sydney. They are planted about 5 feet by 5 feet apart, and the best soil is loam or a good sandy loam. The leaves are recommended to be cut in the fourth or fifth year, but better samples are obtained later. In the sixth year from planting the flower stems are sent up indicating full growth. These plants are very hardy, and will be likely to grow in any place where cultivated plants of any kind succeed. Their native home is Mexico, where, I believe, the climate is generally dry. They will not grow to much in pure sand without moisture, although they will keep alive in such a soil. The good strong soil found about Coolgardie should suit it very well, but ground that is saline is unfavourable. Stiff and wet soil is unsuitable."

DALGETY'S REPORT.

Messrs. Dalgety & Co., Ltd., Wool and Grain Brokers, report as follows in connection with their Perth and Fremantle markets for the month ending 9th December:—

New season's produce is now coming forward to the coastal markets much more freely, and in addition to sales of produce for immediate delivery, considerable business is being done forward.

Wheat.—Deliveries of new wheat from the early districts continue on a free scale. Prices for December delivery opened at 3s. 6d. per bushel Northam (this being the chief centre for goldfields distribution), but later on in the month the market receded to 3s. 3d. There seems to be some distinct and organised efforts to bear country markets, and notwithstanding the good harvest and low prices ruling in the Eastern States, it does appear that the West Australian farmers, with the goldfields close at hand, would not be getting the full benefit of natural advantages when selling on to-day's ruling quote at Northam, namely, 3s. 3d. per bushel. Sales at this price are restricted, farmers being in a position to hold for a better market, which they seem justified in doing. To-day's ruling quotes in Adelaide for December delivery are 3s. per bushel;

and even should Adelaide market recede 1d. per bushel, the margin between that market and West Australian country values seems inadequate. At Perth and Fremantle, early in the month, sales of new season's wheat were effected up to 4s. 9d. per bushel, but in sympathy with weaker country values our markets at these centres now stand at 3s. 9d. per bushel.

Algerian Oats.—Local Algerians are now coming on to the Perth and Fremantle markets more freely, and as a consequence of much weaker values in the Eastern States prices are proportionately low. The demand is steady. Clean heavy milling, extra prime, sold at from 2s. 8d. to 2s. 9d. per bushel, whilst other qualities ranged from 2s. 4d. upwards, according to sample.

Chaff.—October and November have been busy months in this line, the arrivals to the Perth and Fremantle markets being exceptionally heavy. We handled 1,500 tons at auction, most of which consisted of new season's chaff drawn from the following districts:—Meckering, Grass Valley, York, Midland, Northam, Mt. Kokeby, and Narrogin. At the beginning of November, prime green wheaten chaff was selling at £4 12s. 6d. per ton; and to-day the same quality was in good demand at from £4 2s. 6d. to £4 5s. per ton. To-day's rates for other qualities are as follow:—

New season's prime green wheaten ...	£4 to £4 5s.
Good quality new season's wheaten ...	£3 10s. to £3 17s 6d.
Prime oaten	£3 17s. 6d. per ton
Medium wheaten	£2 15s. to £3 7s. 6d.
Inferior samples	£1 7s. 6d. per ton upwards.

Hay.—Wheaten hay is being freely purchased on account of stock shippers for extended delivery throughout the year 1904. Nominal value, £3 10s. per ton f.o.r., Fremantle. Oaten hay is in good demand at Perth just now; nominal value £3 15s. per ton.

Barley.—Business in local malting barley is very limited just yet; and we anticipate that no extensive business will be done until after Christmas. Local Cape barley is coming forward freely, and is selling at from 2s. 6d. to 2s. 8d. per bushel, according to quality.

Potatoes.—New local potatoes are in good demand at from £10 to £13 per ton for prime.

Wool, Hides, Skins, etc.

Wool.—Weekly sales have been held during the past month, the catalogues being chiefly composed of odd bales of mixed qualities; and owners are again reminded of the desirability of having the different classes shown separately. Competition, which at the early part of the month was decidedly keen, has been seriously affected during the past fortnight by the adverse reports received from London, and buyers are now holding off, and prices for all descriptions have fallen from 5 per cent. to 10 per cent.

Good Merino and fine Crossbred fleece,	8d.	to	8½d.	per lb.
Medium ,, ,, ,, ,,	7½d.	,,	8d.	,,
Inferior ,, ,, ,, ,,	5d.	,,	7d.	,,
Washed ,, ,, ,, ,,	10½d.	,,	10¾d.	,,
Merino and fine Crossbred pieces	4½d.	,,	5¼d.	,,
,, ,, ,, bellies	4d.	,,	4½d.	,,
,, ,, ,, locks	1½d.	,,	2½d.	,,
,, ,, ,, lambs	5d.	,,	5½d.	,,

Sheepskins.—Large catalogues have been submitted, and satisfactory clearances made, some good conditioned lines of ¼ wools selling up to 5⅞d. per lb., but in sympathy with the latest London results, prices have fallen ¼d. per lb.; heavy conditioned, inferior, and damaged lots being even more affected. Shorn pelts continue to sell exceptionally well. Spring lambs are ½d. per lb. cheaper.

Sheepskins.

Merino super., 6½d. to 7d. per lb.
„ medium, 6d. to 6½d. per lb.
„ inferior, 5¼d. to 5¾d. per lb.
„ ¼ wool, 5d. to 5⅞d. per lb.
„ pelts, 4½d. to 5½d.
Lamb pelts, 4d. to 4½d. per lb.

Crossbred super., 6½d. to 7d. per lb.
„ fine, 6¼d., to 6½d. per lb.
„ medium, 5½d. to 6d. per lb.
„ coarse, 4¾d. to 5¼d. per lb.
„ pelts, 3¾d. to 4½d. per lb.
Spring lambs, 4¾d. to 5¼d. per lb.

In all classes where pelts are sun-dried, weevil-eaten, cut, torn, or perished, values are from 1d. to 1½d. per lb. below quotations.

Hides.—Supplies have arrived freely, and fair sized offerings have been made during the month, and all forward have met with keen competition. Values for heavies have improved ⅛d. to ¼d. per lb., and light weights fully ½d. per lb. since our last report.

Hides.

Prime, stout and heavy, 5½d. to 6d. per lb.
Medium heavy, 4¾d. to 5d. per lb.
„ light, 4½d. to 4¾d. per lb.

Prime heavy, 5d. to 5½d. per lb.
„ light, 4¾d. to 5d. per lb.
Extra light, 3½d. to 4d. per lb.

Attention to flaying and preparation for market is most necessary, as all damaged lots rule fully ½d. per lb. below quotations.

Tallow.—Prices have fallen steadily, in sympathy with other markets and through supplies being in excess of requirements :—

Prime mixed	21s. 6d. to 22s. 6d. per cwt.
Medium „	20s. to 21s. 6d. per cwt.
Inferior „	18s. to 20s. per cwt.

Kangaroo, Wallaby, and Euro Skins have elicited keen inquiry, and all forward have sold readily at quotations :—

Kangaroo Skins.

Grey fresh, ½lb., 1s. 3d. to 1s. 6d. per lb.
Grey fresh, ¾ to 1½lbs., 2s. to 2s. 4d. per lb.
Red fresh, ¾ to 1½lbs., 2s. to 2s. 2d. per lb.
Perished lots, 1s. to 1s. 6d. per lb.
Grey fresh, 2lbs., 1s. 7d. to 1s. 9d. per lb.

Red fresh, ½lb., 1s. to 1s. 3d. per lb.
Red fresh, 2lbs., 1s. 6d. to 1s. 9d. per lb.
Wallaby, 1s. 8d. to 1s. 9d. per lb.
Extra light, to 8½d. per lb.
Euro, 1s. 3d. to 1s. 6d. per lb.

Hair, Horns, and Bones.

Horse Hair, to 1s. 3d. per lb.
Cow Tails, to 6¼d. per lb.
Horns, large, to 32s. 6d. per 100

Horns, small, 5s. to 12s. per 100
Rough Bones, 70s. per ton.

KALGOORLIE.

The Secretary of the Kalgoorlie Municipal Markets reports for the past month :—Business has very much improved. Early fruits, such as plums, cherries, gooseberries, and apricots, are beginning to come forward. Poultry is still scarce, and prices high. Vegetables have fallen off in supply, and prices have hardened. The following lines have been cleared at prices as below :—

Cabbages, 12s. 6d. to 16s. per cwt.; Swedes, 4s. cwt.; new potatoes, 13s. 6d. to 15s. cwt.; onions, 12s. at the beginning of the month, dropped to 7s. 6d. cwt.; peas, 3½d. lb.; broad beans, 1d. to 2d. lb.; French beans, 3¾d. lb.; carrots, 1s. 6d. to 2s. doz.; parsnips, 1s. 6d. to 2s. 3d. doz.; beet, 1s. 3d. to 1s. 9d.; lettuce, from 1s., dropped to 4d. per doz.; spring onions, 1s. to 1s. 6d. doz.; herbs, 2s. doz.

Fruit.—Oranges, 15s. to 18s. case; lemons, 8s. to 9s. 6d. case; cherries, 20s. to 30s. case, lot of inferior sorts 10s. to 15s. case; apricots, only few to hand, very small, 15s. to 20s. case; plums, 9s. to 5s. case; gooseberries, 9s. 6d. to 4s. 6d. case.

Fowls, 9s. 6d. to 10s. pair; ducks, from 12s. 6d., dropped to 9s. 6d. geese, from 16s. to 20s. pair; turkeys, none offering.

Fresh eggs, 1s. 3d. to 1s. 6d. doz.

Chaff, £4 10s. to £5 10s. per ton; market very unsettled.

GARDEN NOTES FOR JANUARY.

By Percy G. Wicken.

Most gardens will begin by this time to show the effects of the dry weather, although, as it has been such a remarkably cool season, vegetables will be later than in the average season. The supply of vegetables will soon begin to fall off as the soil becomes drier, but this is compensated for to a great extent, by the quantities of fruit and tomatoes which ripen as the weather becomes warmer. Very little sowing can be done during the next few months and attention should be given to keeping the vegetables already growing from becoming dried up, and this can only be done by the incessant cultivating or stirring of the soil. The capillary action of the soil, is the action by which the water is raised through the cracks and small pores in the soil, from the subsoil to the surface, from which it evaporates by the action of the sun; by constantly stirring the soil, these cracks and pores are broken up and destroyed and the evaporating of the moisture is checked. In fact the surface soil is made to act as a mulch to the subsoil, in much the same way as we place straw or manure around trees to act as a mulch to keep the soil moist and conserve the moisture. Plenty of well rotted stable manure should be dug into the ground as this will also absorb and help to retain a large amount of moisture. Cut worms are very troublesome at the present time and owing to their habits of living in the ground are very hard to get at. The best method of dealing with them is to lay a supply of poison close to the plants which they are attacking, the poison is made by mixing together 10lbs. bran, 4lbs. molasses and 4oz. Paris green. First make the Paris green into a paste with a little water, and then add and thoroughly mix it with the molasses, add the bran and work up into a paste. This mixture being a poison should be placed out of the reach of fowls or any of the live stock about the farm. Every year that insect pests are allowed to breed unchecked they become worse pests and are eventually a serious loss to the settler.

Beans (French).—Are one of the best vegetables to grow during the summer months. They will stand a great amount of heat. A few rows should be planted every week or two, where the ground is moist, so as to keep up a supply.

Beans (Madagascar).—These beans are splendid climbers, and, although rather strong in flavour, still make a good vegetable where the supply is not too plentiful. They can be planted almost any time, and are very prolific. The beans grow in clusters, and should be sliced up and eaten the same as French beans.

Beans (Lima).—In moist places a few more rows of the dwarf varieties should be planted. These beans are well worth the attention of gardeners. They make an excellent vegetable, are prolific, and grow during the summer months.

Beets (Silver).—The early sown beets should now have a good supply of young leaves. These plants will grow in a hot, dry district and make a welcome addition to the table.

Chokos.—These are a very quick growing vine and the earlier planted ones will require to be tied to a fence and trellis. The whole fruit is planted as soon as the shoots appear.

Cucumber.—Early sown cucumbers are now plentiful, in moist localities or where water is available a farther supply may be sown.

Egg Plants.—Young plants will require planting out, and in moist places a few more may be sown.

Maize (Sweet).—This table variety of maize is one of the quickest growing varieties, and can be sown at almost any time when there is no danger of frost.

Melons.—Should be now getting ripe. It is a good plan to look through the bed and pick out the best melons truest to name and save them for seed. If the word "seed" is marked on the melon with a knife it will not hurt the fruit and will save it being eaten.

Pumpkins and Squashes.—In cool districts a little seed of the earlier and bush varieties may be planted, but others have very little hope of success. The earlier sown varieties should be now fit for market.

Sweet Potatoes.—Should now require hilling up, and this should be done before the vines start to run too much, otherwise it is difficult to work between the rows.

Tomatoes.—A further supply of plants may be put out, but they will require to be well shaded from the sun until the roots are established. Black spot and other fungus diseases attack this plant; the best remedies are to tie the plants up to stakes to keep off the ground, and to spray with Bordeaux mixture.

Farm.—By the time these notes appear in print the hay crop in nearly all parts will be carted in and stacked. Owing to the heavy growth of grass which has now become very dry the danger from bush fires this season will be very great, and fire breaks should be ploughed round all hay stacks and farm buildings so as to protect them in case of an outbreak. The use of wax matches should be discountenanced, as these are the cause of most fires through being thrown down while still burning. Most varieties of wheat saved for grain will now be ready for cutting, varieties that shell easily, such as Steinwedel and Sullivan's prolific require to be cut just before they become fully ripe, so as to save as much of the grain as possible, other varieties can be left in the field until fully ripe. The Bot fly will probably be again troubling the horses at this time of the year. The fly lays its eggs on the hairs of the animal, generally on the jaws and shoulders, the animal licks them off and swallows them. If the horses are well groomed the eggs are generally rubbed off; or a good preventative is to rub the jaw and shoulders with carbolised oil, or wash them with carbolic soap or some other substance objectionable to the fly and that will not hurt the horse.

THE CLIMATE OF WESTERN AUSTRALIA DURING NOVEMBER, 1903.

The weather in the South-West has been on the whole very pleasant, though a few warm days were experienced. The rainfall in this district was about an average, but very little fell in the neighbourhood of Perth until the evening of the 29th, when a thunderstorm, accompanied by heavy rain, passed over Rottnest, Perth, and Guildford, extending, however, only a few miles North or South.

The atmospheric pressure over the whole State was considerably below normal; and the temperature inland, over the goldfields and all North of Geraldton, was rather below the average for previous years. During the month the maximum did not reach 100° at any station South of Laverton. The tropical rains have commenced in the East Kimberley district, but over the rest of the Tropics and Gascoyne none fell, and on the Goldfields the fall was below the average.

The Climate of Western Australia during November, 1903.

Locality.		Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						November, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
NORTH-WEST AND NORTH COAST:	Wyndham ...	29·802	29·854	29·995	29·622	99·0	81·2	90·1	111·8	74·0	98·5	80·8	110·0	69·2	121	4678
	Derby	29·822	29·859	29·980	29·685	97·5	74·9	86·2	107·0	70·0	98·6	77·3	112·5	68·8	*Nil*	2188
	Broome ...	29·848	29·861	29·972	29·705	88·0	74·0	81·0	96·0	72·0	93·8	76·4	111·0	67·8	*Nil*	1618
	Condon ...	29·833	29·870	29·979	29·720	89·2	67·8	78·5	100·1	61·6	96·0	68·8	112·8	59·0	*Nil*	925
	Cossack ...	29·854	29·877	30·012	29·697	94·5	69·0	81·8	103·0	66·1	98·4	71·8	111·7	62·4	*Nil*	967
	Onslow ...	29·870	29·893	29·980	29·650	89·0	64·0	76·5	100·0	61·0	94·5	65·5	110·0	52·5	*Nil*	635
	Carnarvon ...	29·908	29·970	30·046	29·703	80·2	65·2	72·7	96·7	60·0	82·2	65·2	109·0	52·2	*Nil*	1234
	Hamelin Pool...	29·890	29·948	30·070	29·660	85·0	61·0	73·0	100·0	54·0	90·1	60·1	109·0	46·4	1	740
	Geraldton ...	29·930	30·018	30·100	29·710	76·0	60·0	68·0	93·0	51·0	77·0	57·7	102·5	45·0	5	2379
INLAND:	Hall's Creek *	29·819	29·880	29·993	29·638	101·2	74·4	87·8	106·0	67·4	101·1	75·2	109·4	59·8	224	3386
	Marble Bar ...	...	...	...	...	105·1	71·6	88·4	113·8	66·8	...	...	...	...	*Nil*	656
	Nullagine * ...	29·774	29·836	30·050	29·618	102·2	69·1	85·6	110·0	59·5	102·0	70·3	111·8	52·0	*Nil*	666
	Peak Hill ...	29·805	29·866	30·050	29·580	92·0	66·0	79·0	100·0	59·0	94·6	67·4	106·5	52·3	20	544
	Wiluna ...	29·795	...	30·125	29·583	91·0	64·7	77·8	104·5	56·6	...	...	...	...	*Nil*	716
	Cue	29·858	29·906	30·128	29·696	89·6	62·8	76·2	102·4	53·1	93·8	63·0	108·2	48·9	*Nil*	565
	Yalgoo ...	29·845	29·929	30·120	29·640	87·4	59·8	73·6	102·2	51·4	91·4	59·5	107·7	47·0	*Nil*	708
	Lawlers ...	29·830	29·903	30·190	29·573	87·6	62·1	74·8	104·8	55·0	91·4	63·9	105·4	45·5	11	916
	Laverton ...	29·869	...	30·251	29·577	87·0	61·2	74·1	101·9	51·3	...	...	...	...	*Nil*	834
	Menzies ...	29·881	29·926	30·248	29·587	85·9	59·2	72·6	99·0	50·2	89·2	61·3	105·9	47·0	3	1334
	Kanowna ...	...	...	...	...	81·2	54·0	67·6	99·2	48·0	...	...	...	...	38	1096
	Kalgoorlie ...	29·905	29·950	30·288	29·545	83·3	56·6	70·0	98·5	48·3	87·4	58·8	104·8	47·2	11	969
	Coolgardie ...	29·894	29·958	30·284	29·558	82·7	55·6	69·2	99·0	46·0	87·2	57·5	106·1	46·2	15	830
	Southern Cross	29·900	29·945	30·220	29·590	84·0	56·0	70·0	98·0	47·0	87·8	55·4	108·5	43·2	53	842
	Walebing ...	...	...	...	...	78·3	52·9	65·6	96·4	44·6	...	...	...	...	6	2156
	Northam ...	...	...	...	...	83·0	54·5	68·8	96·0	41·0	...	...	...	...	37	1779
	York	29·935	30·003	30·230	29·720	81·0	53·0	67·0	96·0	46·0	83·6	52·0	110·2	40·3	57	1654
	Guildford ...	...	...	...	...	79·7	57·0	68·4	98·0	48·8	...	...	...	...	132	3656

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Climate of Western Australia during November, 1903—*continued.*

	Locality.	Barometer (corrected and reduced to sea-level).				Shade Temperatures.									Rainfall.	
						November, 1903.					*Average for previous Six Years.					
		Mean of 9 a.m. and 3 p.m.	Average for previous years.	Highest for Month.	Lowest for Month.	Mean Max.	Mean Min.	Mean of Month.	Highest Max.	Lowest Min.	Mean Max.	Mean Min.	Highest ever recorded.	Lowest ever recorded.	Points (100 to inch) in Month.	Total Points since Jan. 1.
South-West and South Coast:	Perth Gardens ...	29·977	30·027	30·207	29·733	79·0	57·7	68·4	97·4	51·1	79·5	57·0	105·0	41·0	104	3490
	Perth Observatory	29·970	30·036	30·200	29·733	76·0	57·3	66·6	96·7	50·7	74·8	56·2	100·9	45·7	130	3506
	Fremantle ...	29·966	30·040	30·207	29·760	72·5	58·7	65·6	91·5	51·5	71·7	58·0	94·4	48·8	110	3287
	Rottnest ...	29·962	30·012	30·179	29·744	72·1	58·9	65·5	93·0	49·6	70·8	59·0	92·8	49·6	133	2883
	Mandurah ...	...	...	...	...	76·1	55·4	65·8	95·1	46·1	...	...	...	...	3	3606
	Wandering ...	...	...	...	...	73·9	45·7	59·8	92·0	41·0	...	...	...	...	20	2731
	Collie	...	...	...	...	74·7	49·1	61·9	92·5	37·5	..	...	...	...	43	3701
	Donnybrook ...	...	...	...	...	74·1	50·7	62·4	93·1	36·9	...	...	...	...	25	9668
	Bunbury ...	29·985	30·046	30·230	29·760	73·8	53·2	63·5	92·3	43·0	73·1	52·7	92·5	42·7	42	4328
	Busselton ...	...	...	...	...	74·1	51·5	62·8	90·0	42·0	...	...	...	...	10	3029
	Cape Naturaliste	...	...	...	...	69·8	53·8	61·8	86·0	48·0	...	...	...	...	44	...
	Bridgetown ...	...	...	...	...	72·8	48·5	60·6	91·9	36·0	...	...	...	...	65	3641
	Karridale ...	29·945	30·052	30·170	29·690	70·4	51·7	61·0	95·2	43·5	70·0	52·2	91·5	38·0	106	3988
	Cape Leeuwin ...	29·975	30·018	30·240	29·620	69·0	58·0	63·5	88·0	53·0	68·0	57·6	84·0	49·0	86	2800
	Katanning ...	29·965	29·996	30·230	29·630	73·9	50·4	62·2	90·0	42·0	78·5	49·5	106·0	37·0	16	2295
	Albany	30·017	30·024	30·318	29·608	68·1	53·1	60·6	90·0	46·0	68·9	52·3	93·5	40·6	170	3921
	Breaksea... ...	30·015	30·034	30·330	29·680	65·0	55·0	60·0	87·0	48·0	65·6	54·9	88·0	43·2	183	3009
	Esperance ...	30·006	30·022	30·343	29·632	72·7	54·0	63·4	98·5	42·0	73·4	54·8	105·0	39·2	29	2359
	Balladonia ...	29·985	...	30·342	29·561	78·6	50·4	64·5	95·5	40·0	...	...	...	...	11	823
	Eyre*	29·974	30·028	30·376	29·616	72·7	54·7	63·7	100·8	35·4	74·0	54·8	108·1	34·5	6	1088
	INTER-STATE.															
	Perth	29·970	30·036	30·200	29·733	76·0	57·3	66·6	96·7	50·7	74·8	56·2	100·9	45·7	130	...
	Adelaide	29·980	30·003	30·260	29·460	80·2	58·5	69·4	96·2	46·3	79·0	55·4	113·5	40·9	257	...
	Melbourne	30·014	29·875	30·332	29·654	72·2	53·6	62·9	93·9	41·9	71·3	50·9	105·7	36·5	428	...
	Sydney	30·080	29·980	30·420	29·770	72·0	59·0	65·5	95·0	51·0	74·2	59·6	102·7	46·2	196	...

* For the first time means of previous years are taken between 1897 (when the Meteorological Service was re-organised) and 1902 (inclusive). All observations prior to 1897 have been rejected, except in the case of the Perth Botanical Gardens.

The Observatory, Perth,
9th December, 1903.

W. E. COOKE,
Government Astronomer.

RAINFALL for October, 1903 (completed as far as possible), and for November, 1903 (principally from Telegraphic Reports).

STATIONS.	OCTOBER.		NOVEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
EAST KIMBERLEY:				
Wyndham ...	3	2	121	8
6-Mile	17	2	162	8
The Stud Station	...	...	...	...
Carlton	...	...	...	...
Denham	...	...	1090	5
Rosewood Downs	...	...	...	...
Argyle Downs ...	...	...	239	12
Lisadell	...	...	...	...
Turkey Creek ...	43	1	318	9
Plympton, St. Mary	...	...	...	...
Koojubrin ...	...	...	...	...
Hall's Creek ...	33	2	224	7
Flora Valley ...	...	...	...	...
Ruby Plains ...	...	...	...	...
Denison Downs...	35	...	...	...
WEST KIMBERLEY:				
Obagama ...	...	...	...	...
Beagle Bay ...	2	1	...	...
Derby	Nil	...	Nil	...
Yeeda	...	...	...	...
Liveringa ...	...	...	...	...
Mt. Anderson ...	...	...	...	...
Leopold Downs...	...	...	...	...
Fitzroy Crossing	Nil	...	Nil	...
Fitzroy (C. Blythe)	...	...	...	...
Quanbun ...	...	...	...	...
Nookanbah ...	...	...	...	...
Broome	Nil	...	Nil	...
Roebuck Downs	21	2	...	...
Thangoo	...	...	...	...
La Grange Bay...	Ni	...	Nil	...
NORTH-WEST:				
Wallal	Nil	...	Nil	...
Condon	Nil	...	Nil	...
DeGrey River ...	Nil	...	...	...
Port Hedland ...	Nil	...	Nil	...
Boodarie ...	...	...	...	...
Warralong ...	Nil	...	...	...
Muccan	Nil	...	...	...
Ettrick	...	...	...	...
Mulgie	...	...	...	...
Eel Creek ...	Nil	...	...	...
Pilbarra	Nil	...	Nil	...
NORTH-WEST—*cont.*				
Coongon	...	...	...	...
Warrawagine ...	...	...	...	...
Bamboo Creek ...	Nil	...	Nil	...
Marble Bar ...	Nil	...	Nil	...
Warrawoona ...	Nil	...	Nil	...
Corunna Downs...	Nil	...	...	...
Nullagine ...	Nil	...	Nil	...
Yandicoogina ...	...	...	...	...
Kerdiadary ...	...	...	...	...
Roy Hill	...	...	...	...
Mosquito Creek	Nil	...	...	...
Mulga Downs ...	...	...	...	...
Woodstock ...	...	...	...	...
Mt. Florence ...	Nil	...	...	...
Tambrey ...	...	...	...	...
Millstream ...	Nil	...	...	...
Yandyarra ...	...	...	...	...
Mallina	...	...	...	...
Whim Creek ...	Nil	...	Nil	...
Cooyapooya ...	...	...	...	...
Woodbrooke ...	Nil	...	...	...
Croydon	Nil	...	...	...
Balla Balla ...	Nil	...	Nil	...
Roebourne ...	Nil	...	Nil	...
Cossack	Nil	...	Nil	...
Fortescue ...	Nil	...	...	...
Mardie	Nil	..	...	...
Mt. Stewart ...	...	...	...	...
Yarraloola ...	...	...	...	...
Chinginarra ...	Nil	..	...	...
Onslow	Nil	...	Nil	...
Peedamullah ...	Nil	...	...	...
Red Hill	Nil	...	...	...
Peake Station ...	Nil	...	...	...
Wogoola ...	...	...	...	...
Nanutarra ...	Nil	...	...	...
Yanrey	Nil	...	...	...
Point Cloates ...	...	...	...	...
GASCOYNE:				
Winning Pool ...	Nil	...	Nil	...
Towara	Nil	...	...	...
Ullawarra ...	Nil	...	...	...
Maroonah ...	...	...	...	...
Gifford Creek ...	21	1	...	...
Bangemall ...	...	...	...	...
Mt. Augustus ...	...	...	...	...

RAINFALL—*continued.*

STATIONS.	OCTOBER.		NOVEMBER.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
GASCOYNE—*contd.*				
Minnie Creek	Nil	...	...	...
Yanyeareddy	Nil	...	...	...
Williambury	Nil	...	...	...
Wandagee	Nil	...	...	...
Bernier Island	10	2	...	...
Boolathana	4	2	...	...
Carnarvon	19	4	Nil	...
Brick House	5	2	...	...
Doorawarrah	Nil	...	...	...
Mungarra	Nil	...	...	...
Sharks Bay	46	3	...	...
Kararang	...	...	...	...
Meedo	19	5	...	...
Tamala	...	...	...	...
Wooramel	27	3	4	1
Hamelin Pool	30	4	1	1
Berringarra	...	...	...	...
Mt. Gould	9	1	...	...
Moorarie	70	2	...	...
Wandary	12	1	...	...
Peak Hill	Nil	...	20	1
Horseshoe	Nil	...	10	1
Mount Frazer	31	1	...	...
Abbotts	51	1	25	1
Belele	65	1	...	...
Mileura	Nil	...	Nil	...
Milly Milly	7	1	...	...
Manfred	20	1	Nil	..
New Forest	...	...	...	...
Woogorong	17	1	Nil	...
Boolardy	Nil	...	...	..
Twin Peaks	10	1	Nil	...
Billabalong	Nil	...	...	...
Wooleane	18	1	...	...
Murgoo	72	3	...	...
Meeka	21	1	...	...
Mt. Wittenoom	...	...	Nil	...
Nannine	8	1	Nil	...
Star of the East	7	1	Nil	...
Annean	27	2	8	1
Tuckanarra	12	2	...	...
Coodardy	9	1	Nil	...
Cue	13	2	Nil	...
Day Dawn	7	1	Nil	...
Lake Austin	28	2	Nil	...
Lennonville	14	4	Nil	...
Mt. Magnet	5	1	Nil	...
Challa	8	1	...	...
GASCOYNE—*contd.*				
Murrum	41	2	...	...
Burnerbinmah	53	5	1	1
Mellenbye	101	7	41	1
Barnong	103	5	...	...
Yalgoo	25	4	Nil	...
Wagga Wagga	12	2	Nil	...
Gabyon	14	1	9	1
Gullewa	75	3	Nil	...
SOUTH-WEST DIVISION (NORTHERN PART):				
Murchison House	52	9	...	...
Mount View	10	1	...	...
Mumby	146	9	...	...
Yuin	16	3	...	...
Northampton	178	7	Nil	...
Mt. Erin	177	7	...	...
Oakabella	253	11	...	...
Tibradden	150	4	3	1
Sand Springs	152	4	66	1
Mullewa	79	7	14	1
Kockatea	108	7	...	...
Bootenal	...	...	...	...
Geraldton	111	10	5	2
Greenough	181	10	59	1
Dongara	192	9	35	1
Dongara (Pearse)	192	10	37	1
Mingenew	145	10	142	3
Urella	92	1	...	...
Yandenooka	130	8	..	..
Rothesay	56	4	...	...
Field's Find	44	4	20	1
Carnamah	126	11	44	2
Watheroo	182	12	18	3
Dandaragan	409	14	12	1
Moora	311	13	20	1
Yatheroo	326	13	Ni	...
Walebing	277	13	6	2
New Norcia	256	16	18	3
SOUTH-WESTERN DIVISION, CENTRAL (COASTAL):				
Gingin	310	12	28	3
Belvoir	257	13	54	3
Mundaring	329	17	80	5
Guildford	336	17	132	4

RAINFALL—*continued.*

Stations.	October.		November.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WESTERN—*continued.*				
Canning W't'r'w'ks	142	11	105	2
Perth Gardens	249	18	104	5
Perth Observatory	224	18	130	7
Subiaco	183	17	110	4
Claremont	169	14	...	...
Fremantle	217	16	110	4
Rottnest	116	13	133	7
Armadale	286	12	...	...
Rockingham	314	11	52	3
Canning River	295	11	118	4
Jarrahdale	413	15	46	2
Mandurah	284	13	3	1
Pinjarra	401	16	20	4
Yarloop	377	17	15	3
Harvey	213	15	20	3
SOUTH-WEST, CENTRAL PART (INLAND):				
Hatherley	189	10	...	...
Momberkine	161	7	...	...
Monglin	244	10	50	1
Newcastle	197	7	13	2
Eumalga	153	10	28	4
Northam	180	10	37	3
Grass Valley	198	9	34	1
Meckering	125	10	23	1
Cunderdin	138	9	...	...
Codg-Codgin	94	11	11	2
Yarragin	86	6	...	...
Doongin	109	7	...	...
Cuttenning	...	...	...	...
Whitehaven	175	12	43	1
Sunset Hills	165	9	37	1
Cobham	173	15	50	2
York	149	13	57	2
Beverley	183	11	36	2
Barrington	120	10	42	1
Stock Hill	116	9	7	1
Sunning Hill	132	6	8	2
Wandering	206	11	20	4
Glen Ern	145	14	11	4
Pingelly	158	8	25	2
Marradong	273	11	18	1
Bannister	235	12	...	...
Narrogin	177	13	14	3
Wickepin	177	11	...	...

Stations.	October.		November.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
SOUTH-WEST—*contd.*				
Gillimaning	169	14	...	...
Bunking	246	11	...	...
Bullock Hills	172	13	...	...
SOUTH-WEST DIVISION (SOUTHERN PART):				
Bunbury	300	14	42	3
Collie	399	19	43	7
Glen Mervyn	420	16	78	6
Dardanup	285	13	11	2
Donnybrook	369	17	25	5
Boyanup	359	18	28	5
Ferndale	547	13	...	...
Busselton	261	15	10	4
Quindalup	310	16	13	6
Cape Naturaliste	252	17	44	8
Lower Blackwood	791	17	70	5
Karridale	416	20	106	13
Cape Leeuwin	301	12	86	9
Biddellia	704	18	176	9
The Warren	658	16	231	9
Lake Muir	541	19	120	8
The Peninsula	535	22	80	11
Mordalup	481	17	95	8
Deeside	549	19	127	7
Riverside	576	17	134	9
Balbarup	612	18	147	7
Wilgarup	637	17	102	10
Mandalup	383	14	...	...
Bridgetown	614	21	65	9
Westbourne	427	18	116	13
Hilton	371	9	...	...
Greenbushes	723	13	34	3
Greenfields	495	17	...	...
Glenorchy	326	10	78	6
Williams	218	14	18	7
Arthur	178	11	26	4
Darkan	274	8	35	3
Wagin	298	10	37	5
Glencoe	383	12	55	4
Dyliabing	174	12	50	6
Katanning	352	15	16	3
Kojonup	462	15	66	8
Broomehill	697	14	184	6
Sunnyside	298	14	20	2
Woodyarrup	427	13	...	...
Cranbrook	425	13	...	...
Blackwattle	406	14	124	7

RAINFALL—*continued.*

Stations.	October.		November.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
South-West—*contd.*				
Woogenellup ...	420	15	118	10
Mt. Barker ...	...	...	219	14
Kendenup ...	495	17	149	9
St. Werburgh's...	422	21	...	...
Forest Hill ...	546	21	241	12
Denmark ...	640	12	...	...
Grasmere ...	540	19	177	15
Albany	494	19	170	12
King River ...	414	13	177	7
Point King ...	330	14	80	6
Breaksea ...	397	17	183	12
Wattle Hill ...	588	16	461	15
Cape Riche ...	294	10	...	...
Pallinup ...	277	13	62	6
Bremer Bay ...	338	12	158	7
Jarramongup ...	166	12	...	...
Eastern Division:				
Dural	Nil	...	...	...
Lake Way ...	6	3	Nil	...
Gum Creek ...	60	1	...	...
Mt. Sir Samuel ...	51	2	Nil	...
Lawlers	23	4	11	3
Leinster G.M. ...	34	2	Nil	...
Lake Darlôt ...	7	1	...	...
Mt. Leonora ...	47	5	6	1
Mt. Malcolm ...	63	5	8	1
Mt. Morgans ...	27	3	15	1
Laverton ...	18	1	Nil	...
Murrin Murrin...	34	3	3	1
The Granites ..	37	4	30	1
Tampa	25	1	39	1
Kookynie ...	62	3	13	2
Niagara	73	3	9	2
Yerilla	93	2	Nil	...
Edjudina ...	92	5	6	2
Menzies	60	4	3	1
Mulline	26	2	10	1
Waverley ...	98	6	15	2
Goongarrie ...	69	3	11	2
Mulwarrie ...	64	5	Nil	...
Bardoc	52	2	Nil	...
Kurawa	97	6	17	2
Kurnalpi ...	59	4	...	...
Bulong	86	4	47	3
Kanowna ...	88	6	38	3

Stations.	October.		November.	
	No. of points. 100 = 1in.	No. of wet days.	No. of points. 100 = 1in.	No. of wet days.
Eastern—*contd.*				
Kalgoorlie ...	85	4	11	2
Coolgardie ...	46	6	15	4
Burbanks P.O. ...	44	5	22	3
Woolubar ...	98	4	45	4
Widgiemooltha...	67	5	53	3
50-Mile Tank ...	92	6	...	...
Waterdale ...	48	3	...	...
Norseman ...	66	6	90	3
Lake View ...	107	9	90	3
Bulla Bulling ...	56	4	6	1
Woolgangie ...	87	3	41	4
Boondi	82	7	56	4
Boorabbin ...	72	5	46	4
Koorarawalyee ...	97	5	54	4
Karalee	85	5	20	2
Yellowdine ...	76	3	...	...
Southern Cross...	81	6	53	4
Parker's Road ...	94	6	82	4
Mt. Jackson ...	19	1	70	1
Bodallin ...	96	7	55	2
Kellerberrin ...	...	...	26	1
Merredin ...	90	7	28	3
Mangowine ...	95	7	...	...
Wattoning ...	57	2	...	...
Eucla Division:				
Ravensthorpe ...	235	13	95	7
Coconarup ...	142	15	46	8
Hopetoun ...	239	13	147	7
Fanny's Cove ...	165	10	...	...
Park Farm ...	110	14	. .	...
Esperance .	229	16	29	7
Gibson's Soak ...	110	10	67	5
30-Mile Condenser	84	8	66	4
Swan Lagoon ...	80	15	...	..
Grass Patch ...	115	16	56	5
Myrup	182	14	...	...
Lynburn ...	203	10	67	5
Boyatup. ...	183	11	...	...
Point Malcolm ...	162	9	128	8
Israelite Bay ...	117	10	29	6
Frazer Range ...	141	5	...	...
Balladonia ...	94	7	11	2
Southern Hills ...	84	3	...	...
Eyre	78	5	6	2
Eucla	78	5	2	1

The Observatory, Perth,
9th December, 1903.

W. E. COOKE,
Government Astronomer.

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